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GAS JOURNAL

LIGHT • HEAT • POWER • BYE-PRODUCTS

[Founded in 1849 as the "Journal of Gas Lighting."]

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VOL. CLXVI., No. 3180.] WEDNESDAY, APRIL 23, 1924. [76TH YEAR.

EDITORIAL NOTES.

The British Empire Demonstration.

THE gates of the British Empire Exhibition are to-day being opened by His Majesty the King—head of an Empire to which we are all proud to belong, and about which, through this demonstration, millions of people will be learning more than they ever knew before. They will see demonstrated our vast industrial and commercial power; they will learn of the genius of our men at home and in all those parts of the world which come within the appellation "The British Empire;" and they will have Oriental splendour, romance, and primitiveness brought into striking contrast with the materialistic interests of our home activities. It is computed that this amazing creation, contributed to by all parts of the Empire, will draw anything between 30 and 60 millions of people during the six months' run, which figures give a large margin of safety for those who have dared to make statistical prophecy. Anyway, the 240 acres occupied by the buildings, the walks, the open spaces will allow some 300,000 visitors comfortably to distribute themselves there each day, and reap from the vast interest supplied by this epitome of the Empire's resources, wonders, and treasures. The past week has seen remarkable progress towards completion. We are inclined to think the strike that recently took place was a blessing in disguise; for the will to work, and do a patriotic part in getting the huge display ready for the opening, has never had so much spirit put into it by some 15,000 men as during the days that have passed since the breach which caused fear and trepidation as to the inauguration being forcibly belated. Day and night, Sundays and holidays, have been the same for the men; the work has gone on uninterrupted. Leeway has been made up; and to-day there will be throughout the country gratification over the position.

Until a visit has been paid to the exhibition, industrial and engineering men will hardly appreciate all that the two palaces represent in which their products have habitation and representation. The frontage of the Palaces of Industry and Engineering, those who are fond of popular modes of expression and illustration will be interested to know, is the same length as a line drawn from Charing Cross Bridge to Westminster Bridge. The Palace of Engineering alone covers 14 acres of ground. The building is said to be the largest reinforced concrete one that has even been erected; and it is a striking point, for those interested in this type of work, that the experts calculate that in hot weather the metal and concrete will expand to an extent which will cause the building to be 3 in. higher and 4 in. longer. Allowance has been made for this by leaving spaces here and there in the concrete. Next week, in conjunction with the special account of the Gas Exhibit, we shall be presenting our readers with an indication of the features in the Palace of Engineering which will appeal to them. We shall, in fact, endeavour to outline all that the exhibition contains from the primordial raw material—coal—to examples to be seen of the uses of its products. There is the coal mine which has been constructed underground at a cost of £150,000. There is the Gas Exhibit, which occupies some 12,500 sq. ft. in the Palace of Industry, and for which space a rent of more than £8000 has been paid by the gas industry. This exhibit will demonstrate the domestic and industrial applications of coal gas in many ways and forms, and will prove that it is the willing and ever-ready servant of all in any and every sphere of life. In the engineering section there will be much that will further exemplify the same thing. There is a great deal that is electrical in the section. Side by side with it will be seen the uses of gas in providing electrical energy for those who require it for large establishments of any kind. There, too, will be found other illustrations of the use of gas in mechanical operations and for industrial purposes. Back again in the Palace of Industry, one will see not only in the Gas Exhibit, but in the wonderful Chemical Section, many of the chemical products derived from the carbonization of coal. The Chemical Section, in fact, is one of the largest co-operative displays in the exhibition. It occupies 40,000 sq. ft.; in that space £100,000 has been spent; and through the British Association of Chemical Manufacturers some 100 exhibitors have contributed to a very striking display.

We are looking forward with great interest to Wembley. It will this year be the central attraction in the world. It is a great effort which, we believe, is going to help in the revival of our industrial life, and to assist the British Empire to make, through the channels of work and enterprise, some reparation for the great losses it has sustained during the past decade.

The Coal Armistice.

THERE is to be no strike at present in the coal-mining industry. The words "at present" must be deliberately emphasized, as no one in these times cares to prophesy, however good the portents may appear. One thing about which there is not the shadow of a doubt is that there are men on both sides who are desirous that there shall be nothing but a peaceful settlement of the differences as to an increase of wages and of the men's portion of the proceeds of the industry. This is satisfactory. To that end the Minister of Labour (Mr. Tom Shaw) has appointed Lord Buckmaster, Mr. Roscoe Brunner, and Mr. A. G. Cameron to sit as a Court of Inquiry to ascertain the facts relating to the dispute; and it is understood they will begin their work to-morrow. Mr. Shaw believes that the terms of reference are such that they will give satisfaction with regard to the principal object—the ascertainment of the facts, so that the miners, the mine-owners, and the public will know exactly the state of affairs. Given this information, then we shall know on which side there is a balance of right in connection with the continual disputes as to pay that have arisen in the coal industry. The Minister believes that there is every prospect not only of avoiding a stoppage, but of coming to an understanding which will bring peace to the industry for a very considerable time to come. We all devoutly hope that in this he is correct.

Pending the public inquiry, arrangements had to be made for continuing work at the collieries. This was effected last Wednesday at the offices of the Mining Association, when representatives of the coalowners and of the Miners' Federation met. It was then agreed that work should be continued under day-to-day contracts until the report has been presented to the Government by the Court of Inquiry. Moreover, the coalowners agreed to put into operation as from May 1 the new agreement as to the minimum percentage and the ratio of profits to wages, if settlement on these points is reached by May 14. Up to April 30, wages are to continue as at present. The results of ascertainments for January and February are to apply similarly from May 1. It is stated that this means that in all those districts where the men are on the minimum wage, they will from May 1 receive an advance of 12½ p.ct. on their wages; and those who are on the subsistence wage will

receive a further advance equal to one-eighth of their daily wage. In the eastern area—Yorkshire, Derbyshire, Nottinghamshire, Leicestershire, Warwickshire, and Cannock Chase—the men will receive an advance of 20 p.ct. on their wage rates, which is equal to 8s. per week. We hope the next two or three weeks will see outstanding differences cleared away, and a better understanding of the facts of the position than there has been hitherto.

Protection of Gas Interests.

The value of gas suppliers looking well after their interests in connection with the applications to Parliament for new powers by local authorities and railway companies, was well illustrated in the "Journal" last week. There was the proposal of the London County Council to construct a new Lambeth Bridge over the Thames, and the attempted repudiation by the Council of the rights of the Gas Light and Coke Company, who paid the predecessors of the former a sum of £3000 for a perpetual right to carry a gas-main over the existing bridge. The Council sought to have sole determination as to whether or not gas-mains should be run over the new bridge. Their decision might have been a grave public disadvantage. If the Council condescended to find room for the mains on the new bridge, then the Company were to pay the cost of removing the mains from the old bridge to the new one, and also to bear a wayleave charge. The case was argued *pro et con*, with the result that their Lordships resolved that the gas-mains should be reinstated on the new bridge, and the Company's present facilities should be preserved; the cost being borne by the Council. The pipes are to be laid where reasonably possible; and disputes are to be settled by arbitration. The other instance was that of the Great Western Railway (General Powers) Bill, against which both the Cardiff Gas Company and the Holyhead and North Wales Gas and Water Corporation petitioned. In this case, it should be acknowledged, the Railway Company were reasonable, and agreements were effected before the Bill came before a Committee of the House of Commons, by whom they were approved. The Railway Company desired part of the land on which the gas-works of the Holyhead and North Wales Gas and Water Corporation stand; but the severance would render the rest of the site useless for the purposes of the works. Now the Railway Company are to bear the costs of an application for a Special Order to empower the construction of new gas-works on another site, as well as the cost of erecting works of the same capacity as those substituted—the Corporation paying for any excess capacity. The laying of necessary mains and connecting up to existing mains will also have to be borne by the Railway Company. Both the Cardiff Gas Company and the Holyhead Gas Corporation objected to the Railway Company altering the levels of streets, &c., in connection with the carrying-out of new works; and they have secured the necessary protection, and the right to reasonable costs from the Railway Company incurred in removing, or altering the position of, any of their plant, or compensation for any plant rendered useless. All this is only equitable. But there has been an attempt lately—the London County Council have been in the forefront in this matter—to make gas companies pay for any changes caused to their distribution systems by road improvements or diversions. Parliament, however, can protect rights against a flagrant injustice.

Explorations in the United States.

There is always something to be learned from the gas technicians of other countries. From time to time we have had descriptions of what British gas engineers visiting the United States have found as to the conditions there of gas manufacture, distribution, and supply. Now we have another account. Mr. F. S. Townend, B.Sc., of London, and formerly of the Birmingham Corporation Gas-Works, has been to the States; and a paper that he has read before the Midland Junior Gas Association shows that he made excellent use of his opportunity for exploration, and brought back with him much useful information. Indeed, we do not remember having read a paper by a British gas engineer on the gas and coke industries of the United States that has contained more interest. But there is not in it a great amount of detail, for the plain reason that Mr. Townend found so much to which to direct attention that he could do no more within the scope of a paper than present an outline of it all. But that outline indicates very distinct tendencies in connection with the gas manufacturing processes of the United States.

The author first spoke of the influences which have done so much hitherto to shape the history of gas supply the other side of the Atlantic, but which influences are through natural causes on the decline. As this proceeds, we have a fair amount of confidence in saying it will progressively cause a large reversion to coal carbonization. The two factors are natural gas and oil cheaper than we can obtain it in this country. The natural gas is purchasable in cities to which it is piped at a very low price—2½d. per therm is instanced, or about 2s. per 1000 c.ft. The supplies of cheap oil, it is almost needless to say, caused carburetted water gas to be a prominent means of satisfying the gas demands of the communities. Moreover, where neat water gas is supplied, coke as well as oil has to be purchased for the purpose, which means that coke has become a valuable commodity with both this market and the one provided by central-heating equipment open to it. It is well known that natural gas wells are not yielding so generously as they were doing in the heyday of their youth. And as to oil, measurements have been made by those who look to the future to ascertain the length of time that the subterranean supplies will last at the present rate, and with the prospective increase, of consumption. The results are such as to occasion the people of the States critically to survey the future, and to wonder what will happen when the time comes for them to be importers instead of exporters of oil, if by then they have not discovered means for otherwise providing for their home requirements.

There is another tendency in the United States in connection with gas-manufacturing practices which is distinctly different from the movements in this country, and that is the boldness of the gas engineers there in adopting larger unit processes and methods. Mr. Townend illustrates this in various ways. For example, coke-ovens are making greater headway there than here for the production of town gas; one instance given in the paper being Battle Creek, where coke-ovens dealing with 6·1-ton charges, and two charges per day, are in use. Railway coal cars, too, are used with carrying capacities of from 50 to 100 tons. The 20-ton coal-wagon on this side is considered an advance of no mean order from the 10-ton type. But the larger loads in America, it is claimed, produce economies in handling and other ways. It would have been interesting to have the general statement on this point translated into actual money, with a comparison of costs for smaller sizes of wagons. Again, rubber-covered belt conveyors are largely used for both coal and coke; and this is becoming standard practice, and not without good cause. With coal the life of these belt conveyors is remarkably long; with coke—the conditions being more inimical—life is not so long. Just consider a belt coal conveyor having a life of 7 million tons. The belts must be of exceedingly good quality. Consider, too, a belt conveyor dealing with such a hostile substance as coke, having a life of 1 million tons. Being at rest, another advantage is that the coke does not suffer breakage to any large extent. Such tonnage lives are remarkable. These are points which show breadth of vision, and boldness in initiative—all with the view of securing economies, which are highly essential with costly labour. But without capital and working charges, one cannot investigate the value, under British conditions, of similar practices. The same applies to the novel system of coke quenching, which has been influenced by coke-oven practice. The coke is carried by car to a separate brick structure in the form of a tower, there sprayed, and then the car passes to an inclined wharf from which the coke is carried by conveyor to a screening station. The description suggests a somewhat circuitous system. It may have its compensating advantages; but we should like to know something more about them, and about the cost of the cycle of operations. Such elaborate processes can only be justified by the realization of economic and qualitative profit. Mr. Townend tells us the quenching is attended to by one man. But the quenching is only a single part of the work from retorts or ovens to the screening-stage. What is the interpretation, too, of the maximum quenching with the minimum of water? And what is the quantity of moisture contained in the coke on its delivery to the screens?

Turning from these to other matters, Mr. Townend speaks in terms of strong commendation of all-silica settings, the long life of which justifies their adoption. When he tells us of having seen intermittent vertical settings and coke-ovens

which have had a life of seven years and more without any repairs, and the walls almost as good as new, that is good testimony; and when engineers speak of ten years, and the end of life not in view, then we may anticipate, with the great improvement that has been made in the manufacture of silica materials here, that its vogue in high-temperature carbonization will become more and more pronounced in this country, and the unfortunate experiences of the past before the material had reached its present state of perfection will be forgotten. Another development that is of particular interest is the washing of gas in a tower with a dilute solution of sodium carbonate, which removes 85 p.ct. of the sulphuretted hydrogen in the gas before it passes into the oxide vessels. This is said largely to increase purification capacity at small cost, expenditure on oxide purification is brought to a low point, and some of the hydrocyanic acid is removed. Mr. Townend says the difficulties are not yet cleared away for the introduction of the process in England. It would add to interest to know something of the nature of those difficulties. Are they technical or proprietary? Other interesting points of the paper referred to external producers, water gas and waste-heat boilers, and the use of coke-oven gas for urban purposes.

We are confident that the paper will prove as interesting to other readers as it has to us; but they, like ourselves, would no doubt be pleased to have an expansion of the information upon several of the points which are introduced in such a way as to whet, but not satisfy, curiosity. But perhaps later on we shall hear more of these matters.

The Main of Insufficient Capacity.

THE National Gas Council are very hopeful that they will be able to effect an agreement with the railway companies respecting their disapproval of the mains-of-insufficient-capacity clause, which has already appeared in several Gas Acts and Special Orders. It is a wise and expedient clause for the protection of existing consumers, where a main would be of inadequate capacity for new demand, until such time as a remedy can be applied. The railway companies appear to object *in toto* to the clause, inasmuch as they consider that it removes from the consumer the right he possesses under ancient and still existing legislation to demand a supply of gas as and when he pleases. It does nothing of the kind, otherwise than in a case where an exceptional condition prevails. Undoubtedly, a question of principle is involved. There is, however, no recognition on the part of the railway companies that the demands of consumers and the incidence of those demands are very different from what they were in the days gone by. There is, in our opinion, a substantial amount of unreasonableness in their obduracy. Though there are negotiations in progress between them and the National Gas Council, with a view to finding an avenue by which compromise can be effected, it is obvious, from what transpired in connection with the Marple District Council Order, that they are not content to wait for the result of the negotiations, if they can snatch a decision from a Select Committee which will give them a precedent of which they approve. We really cannot understand this attitude.

In the case of the Marple Order, the Council had asked the Director of Gas Administration (Mr. H. C. Honey) to eliminate the clause before the Order was submitted to the Select Committee of the House of Commons. The railway companies were informed of this; and they were apparently somewhat incensed over the withdrawal. They did their best still to have the matter argued before the Committee presided over by Mr. D. D. Reid. The Agents drew the attention of the Director of Gas Administration to the terms of a resolution of the House, pointing out that, while the railway companies could have no objection to the Order if the clause were deleted, neither the promoters nor the railway companies could agree to any alterations, and that an amendment could only be made by Parliament upon a report by a Select Committee. The Committee could well see the object of the companies; and they took the right course in regarding the dispute as being upon a point of principle which could be better dealt with elsewhere, and by the appropriate parties. Seeing that the Committee had before them the railway companies only, any statement made by them would have been of an *ex parte* nature, and could not be tested in any way, with the result that a decision upon the clause could not hereafter have been claimed as a precedent. The simplest plan for the Committee to adopt was, as suggested by Mr. Honey, for them to strike out the clause, and approve of the Order. This was the line that the Chairman had previously intimated the Committee could take; and it was carried out. The matter therefore still remains open for settlement. It is to be hoped that other promoters of Special Orders now before the Director will, if the clause is included, adopt the course of withdrawing it, until an agreement is effected with the National Gas Council. The gas industry wants to live on terms of amity with the railway companies; but it must not be at the expense of the industry in the matter of such modification of obligations as is necessitated by modern conditions of gas demand and supply.

A Colloidal Theory of Corrosion.

The subject of iron corrosion is always of importance to gas engineers; but so many theories have been advanced as to its cause, and so many suggestions put forward in regard to the course of the reactions occurring, that it is small wonder a certain amount of confusion exists. Dr. J. Newton Friend, in a paper read before the West of Scotland Iron and Steel Institute, does away with a lot of wreckage, and in a clean-cut review of modern theory makes possible a definite realization of present knowledge regarding this phenomenon. In this respect alone the work is of value. But the author does more than this—he postulates a theory resulting from his own investigation, which will be of interest to all concerned with the upkeep of iron structures. An abstract of the paper, which briefly summarizes the salient points, is published in our columns this week.

Co-Partnership in Industry.

Co-partnership has done well for the gas industry, and for certain other industries where it has been operated with a view to making it a genuine success. Viscount Cecil has introduced a Bill into Parliament having for its object the promotion of the adoption of co-partnership by statutory and other companies. It proposes that every company incorporated by Act of Parliament or registered under the Companies Acts, 1908 to 1917, shall (if not already so empowered) be deemed to have power, without further authority of Parliament or application to any court, to introduce a scheme of co-partnership. It also makes provision, if thought fit, for the appointment of employee directors. Power is also proposed for companies or corporations not formed for the purpose of profit, including municipal corporations or county councils, to pay a bonus on the amount by which the actual expenditure in the department or branch of service in which the employee is engaged is less than "the estimated expenditure of such department or branch, provided that in the case of municipal corporations or county councils, or other public bodies, having power to levy rates, such regulations shall be of no effect until approved by the Minister of Health.

Household Coal Prices.

Very little satisfaction on the subject of high retail prices for, and the inferior quality of, household coal has been realized through the investigation which Mr. E. Shinwell, Secretary of Mines, has been making. He held a conference with representatives of the Coal Merchants' Federation; and he also submitted in writing a number of questions to the Federation in order that they might submit considered replies. Certain of the "facts and figures" sought were not disclosed; and Mr. Shinwell "fears that the public will not be reassured by the answers given." This statement will cause a strengthening of the suspicion of the public in relation to the coal merchants.

Another Strike Threat.

The chain of strikes—threatened and actual—appears to be without end. Just as things begin to look brighter for the building trade, a ballot paper goes out from the National Federation of Building Trade Operatives to decide whether or not the men will accept the employers' offer of an increase of ½d. per hour as from May 1 in respect of areas not recently up-graded, and ½d. per hour as from Aug. 1 in respect of areas already up-graded—the rates to be stabilized until Jan. 1 next. If not, it is then a question of further negotiation or strike action. The Federation had asked for an advance of 2d. per hour; and now they say that if

they could obtain an offer of 1d. per hour the members would be recommended to accept it, as, with the other proposals regarding guaranteed time, &c., this would constitute a reasonable settlement. Pending the taking of the ballot, fourteen days' notice has been given to cease work on April 30. In view of the housing programme of the Government, it is thought possible that the Ministry of Labour will influence further negotiations during the period that the ballot is proceeding.

Unemployment Insurance.

The text of the Bill introduced by the Minister of Labour to amend the Unemployment Insurance Acts has been issued. Consisting of sixteen clauses and three schedules, the measure proposes far-reaching changes in the existing law. For example, it increases the amount by 3s. a week and extends the period of benefit; brings into insurance boys and girls between the ages of 14 and 16 on their entering an insured trade; authorizes the payment of grants for the instruction of unemployed persons; and provides for benefit to workers thrown idle by a trade dispute in which they are not directly concerned. The proposals will add several millions to the expenditure of the country.

PERSONAL.

In succession to Mr. David V. Reid, who, as recently announced in the "Journal," has been appointed gas manager at Gourock, the Directors of the Huntly Gas Company, Ltd., have selected to take charge of their works Mr. Gordon M'Nair, who is at present manager of the Kirkcudbright Gas-Works.

The Congleton Gas Committee have decided to increase the salary of Mr. W. A. Cartlidge (the Manager) by £50, to commence from the beginning of the present financial year, and a further £25 next year. The Chairman (Ald. W. Taylor) told the Council last week that the members of the Gas Committee had unanimously agreed to the increase, and they all highly appreciated the work done by Mr. Cartlidge.

Mr. Thos. J. Page, Inspector-in-Charge of the Wood Green area of the Tottenham District Light, Heat, & Power Company, has retired under the age limit, after having been in the employ of the Tottenham Company for over 58 years. At a meeting of the Board on the 1st inst., the Chairman (Mr. Henry Woodall), on behalf of the Directors, presented Mr. Page with a suitably inscribed gold watch, and wished him every happiness in his retirement. On the 15th inst. a further presentation of a clock, also inscribed, was made by Mr. H. C. Smith (Chief Engineer of the Company), on behalf of the office and distribution staffs. In making the presentation, Mr. Smith said that, while they regretted the fact that Mr. Page was leaving them, their sincere wish was that he would be spared for many years to enjoy his well-deserved rest. His remarks were supported by other members of the staff. Mr. Page, in replying, referred to the great changes that he had seen in the Company, and spoke feelingly of the way in which the Company had looked after him from boyhood to old age.

The marriage took place at Sheffield, on Easter Saturday, of Mr. Fred Staniforth, Manager of the Maltby Gas-Works, and Miss May Madin, daughter of Mr. and Mrs. G. Madin, of Crookes, Sheffield. After the ceremony and the reception, the newly-married couple left for Blackpool for the honeymoon.

The wedding took place at Mickleover, near Derby, during the Easter holidays, of Mr. Edgar Jones, F.C.S., and Miss Kathleen Gladys Twells, only daughter of Mr. and Mrs. J. H. Twells, of Mickleover. Mr. Jones is Chief Chemist to the Derby Gas Light Company. The honeymoon is being spent at Harrogate.

OBITUARY.

Mr. Robert Baker, who will be remembered by many as having retired about seven years ago from the position of Gas and Electricity Fittings Superintendent to the Bolton Corporation (after having been connected with the Corporation for over forty years), passed away on the 19th inst., in his 76th year, at his residence, Back 'oth Bank, Bolton. He leaves a widow and three sons—Mr. W. J. R. Baker, Gas and Water Engineer of Devizes; Mr. F. N. R. Baker, Borough Electrical Engineer of St. Helens; and Mr. W. R. Baker, Managing Director and Secretary of the Stratford-on-Avon Electricity Company, Ltd.

Lubricating Pressure Governors.—Mr. J. A. Harritt, of San Diego, offers the following "wrinkle" on the subject of the lubricating of pressure governors, and it has been reproduced in the pages of the "American Gas Journal:" To eliminate the difficulty with pressure governors on reciprocating pumps, both oil and water, instal mechanical force-feed lubricators so as to inject the oil into the steam ahead of the governors. The governors so lubricated give a remarkably straight pressure curve. This principle can be extended to lubricate steam header valves, which are in constant use in generator operations.

FUEL ECONOMY IN STEAM PLANTS.*

A new book dealing with the principles and practice of combustion, the conditions affecting fuel consumption in boilers, the causes of losses in steam plants, and suggested economies, has been published by Sir Isaac Pitman & Sons, Ltd. It is written by Mr. A. Grounds, B.Sc., A.I.C., and should be useful to students, boiler attendants, and, indeed, to engineers-in-charge. Considering the minute care which is exercised at many works in regard to efficient production, it is strange that so little attention is paid and so little thought given, to fuel economy in steam raising. In spite of the fact that the cost of steam-raising has an important bearing in almost every industry—and especially in the chemical trades—the efficiency of most boiler installations is far from satisfactory. Perhaps this volume will further stress the need for effort in this direction.

The section dealing with losses in steam plants is the most informative portion of the book, and will well repay study. The magnitude of the losses due to escape of heat up the chimney, the effect of excess air, and the influence of an insufficient supply of air, are generally recognized; but this cannot be said of the waste due to radiation from bare pipes. To illustrate this, let us take one or two examples from the book. The loss per square foot per hour per 1° Fahr. from a 3-in. pipe conveying steam at 360° Fahr.—assuming an air temperature of 60° Fahr.—is 3·25 B.Th.U. For a length of 100 ft. the area exposed is 78·55 sq. ft., and the loss of heat per hour is therefore 76,586 B.Th.U., equivalent to the heat of combustion of 5·88 lbs. of coal of a calorific value of 13,000 B.Th.U. This means that, during a year, there is a wastage of heat from this pipe alone equivalent to the combustion of 23·01 tons. In the case of an 8-in. pipe, the wastage is equal to 59·1 tons of coal per annum. Since it is impossible to obtain 100 p.ct. efficiency in the combustion of a fuel, the actual loss through uncovered pipes being exposed to the atmosphere greatly exceeds these figures. With a 6-in. pipe of 100 ft. length conveying steam at 100 lbs. gauge pressure, the loss of fuel over a year amounts to 102·9 tons, assuming the heat value of the coal to be 12,000 B.Th.U. per lb., the air temperature to be 70° Fahr., the boiler and furnace efficiency to be 60 p.ct., and the time worked 24 hours a day at 365 days a year. The author explains how these serious leakages can best be avoided, and discusses briefly other causes of waste—such as moisture in the air, wind, scale, &c. The subject of economizers and air heaters is dealt with very briefly, and the final section of the book is given over to boiler management.

Industrial operations daily increase in complexity, and engineers-in-charge—in common with nearly all other workers in this fast-moving age—realize that good and progressive management depends upon the efficient use of their own time. They demand books wherein facts are given in a clear manner, free from an indigestible mass of verbiage. They also have little use for a reproduction—however beautiful it may be—of makers' catalogues. They want the expression of experience, and opinion based on experiment. "Fuel Economy in Steam Plants," which is not a 'catalogue de luxe," certainly fulfils the first condition; and, though there is little that is new in Mr. Grounds' book, it will be read with interest, and the facts in it remembered, by many who will derive great benefit from its perusal.

* "Fuel Economy in Steam Plants," by Arthur Grounds, B.Sc., A.I.C. Published by Sir Isaac Pitman & Sons, Ltd., Parker Street, Kingsway, W.C. 2. Price 5s. net.

WATER GAS FROM BITUMINOUS COAL.

The publication of one of a series of publications dealing with investigations relating to the manufacture of water gas (Technical Paper No. 274) is announced by the United States Bureau of Mines. It is by Mr. W. W. Odell, and is entitled "Efficiencies in the Use of Bituminous Coking Coal as Water-Gas Generator Fuel." For this purpose bituminous coals have been employed to some extent during the past few years in Illinois and the surrounding States; and the results obtained were encouraging enough to warrant further study of prevailing conditions, with the object of determining what changes in the construction of a water-gas plant might be made to secure greater economies in the use of bituminous coal as generator fuel. The results of the investigation indicate that, at the present time, with the prevailing high price of coke, water gas can unquestionably be made from bituminous coal more cheaply than from coke. When, however, coal is substituted for coke, and the same methods of operating are employed as with coke, there is an appreciable waste of fuel, which can be eliminated. The amount of this waste per 1000 c.ft. of gas made will increase as the standard of gas is lowered. One method of eliminating waste—the use of a waste-heat boiler with combustion chamber—is, says the "Gas Age-Record," suggested and discussed in the paper. The investigation referred to was conducted under a co-operative agreement between the Bureau of Mines, the State Geological Survey Division of the State of Illinois, and the Engineering Experiment Station of the University of Illinois.

ELECTRICITY SUPPLY MEMORANDA.

The way of development of the electric cooker has been difficult. What advance has been made has been by the process of slow experiment—practically always beginning over again, as the previous experience could only be classed as a failure. The fact shows that there is something inherently wrong with the application of electricity to this purpose.

Development of the Electric Cooker.

An easily-applied fuel needs only simple provision. And after all, when the sum of improvements that have been effected in the electric cooker are examined carefully, one is not particularly struck with the magnitude or the efficacy. They really only serve to accentuate how much more easily the same thing is accomplished, and better accomplished, by other means and another agent. This simplicity, and the greater effectiveness and economy, are qualities that will ever be an important asset in favour of the one agent over the other. However, the slow and tedious road along which the electric cooker has journeyed to secure the present degree of efficiency is well illustrated in a paper read by Mr. F. Smith at a conference of the West Riding (Aire and Calder) Electricity District "E.D.A." Provisional Area Sub-Committee. We are pleased, by the way, that we have not to find storage room for that title. But to the cooker. It is confessed that though the electric cooker has been under development so long (shall we say thirty years or so?) the only progress that has been made has been in the oven; while the hotplate—the vital element of a cooker, and the part from which so much is required on a gas-cooker—is still a very lame thing, with very little go in it. Scrutinizing the history of the so-called development, it has been more or less in the nature of structural detail. It is true that in the early days a suitable wire for the purpose was a desideratum; for those then tried would not run for any length of time without "going west." But about fifteen years ago an alloy was discovered which superseded all the preceding wires. Fifteen years is a long time; and yet the electric cooker has only been brought to the present stage of indifferent development. It is claimed that experiment and experience have accomplished first a better mechanical design of carcass. That is not a great achievement. A suitable design should have been one of the first items to be mastered. But we remember how for years gas-cooker castings were purchased and adapted to the purpose. The next thing claimed is cleanliness. Any cooker properly constructed with that desirable end in view can be kept hygienic, if in the hands of a person who abhors dirt. Then the next success claimed is greater reliability. There was room for it; but we know from the experience of users of modern electric cookers that there cannot be a guarantee as to reliability, for things have a nasty irritating knack of going wrong just at the most inopportune times. And unreliability is not confined to the cooker. It is a long stretch between the cooker and the generating station; and between those two points many troubles may occur which assist to prove that electricity for cooking purposes is not the most dependable thing on earth. Then there are the points as to accessibility, interchangeability, and ease of replacement of defective parts. Those are purely questions of design, and do not add to the thermal efficiency of the process or to cooking economy. They are all necessary, all conveniences; and ease of replacement of defective parts is more essential with electric cookers than with other cookers. Then there is reduction of first cost and of maintenance charges. There have no doubt been reductions. There was room for them; nevertheless the electric cooker is a far more expensive article than the gas-cooker. It cannot help being so; its very nature will not permit of it. being otherwise.

The Oven.

There must be agreement with Mr. Smith that the early electric cookers were heavy, clumsy structures. Then passing from the one extreme to the other, there came the tin-box form of oven—single or double cased, with (when new) a highly polished exterior—the idea being that this caused a reduction of heat loss by radiation. Of course, electrical people recognize that such expensive B.Th.U. as those they supply must not be allowed to rove from their destined purpose more than is unavoidable. But it was found that the construction was not sufficiently robust to stand rough usage for any length of time. Thus it came about that carcases were specially designed for electric cookers; and further to conserve dearly-bought heat, it was realized that the oven must be double cased, and packed with insulating material—usually silicate cotton. Then the parts of the oven that are liable to become splashed by fatty substances are now made removable for cleaning, and to permit access to the heating elements. It is the practice to-day to construct the ovens on legs; and this is a wise provision for more reasons than one. Ventilators are provided near the top of the oven door, and it is said to be an economy to instal a thermometer, notwithstanding the use of fixed heats only. The old types of oven heating elements were expensive to make, and not repairable at a reasonable cost. Their lives, too, were short. Then came mica elements. The practice is to suspend these in the oven, and to allow the air to circulate past them. They are screened from the cooking space, and protected from accidental contact by persons using the oven. This method of "floating elements," it is said, leads to quicker heating. Then the mica was found to be unsatisfactory as a supporting base for the wire, and several makers therefore adopted fireclay strips, on which the elements are wound. For these elements longer life is claimed and lower maintenance costs. But the elements could not be repaired, and had to be replaced when they got out of order. Another type has been devised, which on a breakdown only necessitates the renewal of the element wire, at, it is stated, a low cost. In the new type, the fireclay base is reinforced by iron strips. Then there has been elimination of beaded and asbestos covered leads, and "small fiddling connections" have been done away with which were potential sources of trouble. Mr. Smith is in favour of side-heated ovens. But all these points are structural ones; and they do not subscribe to any improvement in thermal efficiency, though we do not deny that they do to working efficiency.

The Hotplate.

Coming to the hotplate, one development is its hinging, so as to give better access to the connections; but as to the boiling-plates, Mr. Smith acknowledges that "there is still a lot of work to do in connection with this very important part of the cooker." From the first there has been trouble with the boiling-plates; and many have been the devices brought out with a view to surmounting troubles and securing a higher efficiency. Though work in this direction has been increasing, Mr. Smith owns to the large scope there is for making improvement. There are the enclosed and the semi-open types of plate. One advantage of the introduction of the radiant form is that it has done away with the necessity of fitting devices for indicating that the current is on. The introduction of the series parallel rotary switch, it is claimed, has simplified the control problem. For control purposes, Mr. Smith explains, the elements are split into two circuits. The switch gives full heat when the two circuits are each in parallel across the mains; medium when one circuit only is in parallel; and low when the two circuits are in series with one another. Thus "Full," "Half," and "Quarter" heats can be obtained with the one switch. Improvements in large cooking apparatus have followed on similar lines to those described for the domestic cooker. As far as possible the elements used on large apparatus are interchangeable with those employed on domestic cookers. This reduces to the minimum the number of spares which a supply authority must keep.

Cost of Wiring.

The wiring notes by "Megohm" in the "Electrical Times" are always interesting, and often very much to the point. He is an avowed enemy of shoddy work and of inflated prices for the best work. It is his belief that the National Register of Electrical Contractors will do much that is effective in the campaign against cheap and nasty wiring. Another thing which would help is a reduction of costs for good wiring. He is convinced that it is far too expensive; and to offer the public something they cannot afford is not the way to shepherd them from bad to good quality work. "Megohm" asserts that to-day best-quality screwed barrel is prohibitively dear for the middle class client; and concealed work with flush switches has become an absolute luxury, for the cost of making good is now an enormous item, owing to the condition of the building trades. It is evidently the labour that is at fault, seeing that wiring material and accessories are not at present abnormally dear. It is up to the contractor to see that he gets the most out of his labour. Reading between the lines it is clear that "Megohm" is not satisfied that this is the case to-day, which means that high prices are being paid for an inadequate amount of work. That is not the way to lessen costs, and to produce an increase of business and employment.

Wiring on Extended Payment Terms.

In this connection there is interest in a recommendation of the Electricity Committee of the St. Marylebone Borough Council that wiring should be undertaken on extended payment terms. The proposals, as set out in the "Electrical Times," are that the work should be undertaken by contractors—preferably local firms—to specifications prepared by the Electricity Department. A percentage addition it is suggested should be made to cover the department's expenses, *plus* a percentage for the outstanding payments, which would be spread over any period up to five years as a maximum, this maximum to be only permitted in special cases. Instalments it is proposed should be payable monthly or quarterly, as may be agreed. The financing of the scheme would be from surplus revenue account. Wiring for lighting would be undertaken, as well as for cooking and heating, in premises which are not already connected, or for additional points in premises already connected. Each consumer would be required to sign a hire-purchase agreement form, similar to that used for the supply of apparatus; and where the occupier is a short-lease holder only, and the lease so requires, the consent of the property owner would have to be obtained. The details have not yet been settled.

Prohibited.

The old question as to municipal authorities owning electricity supply undertakings having power to sell and deal in electrical appliances, has been revived before a Committee of the House of Lords in connection with the Wakefield Corporation General Powers Bill. In this the Corporation sought to be em-

powered to sell and deal in electrical fittings, lamps, and other appliances. It will be remembered that the Electricity Supply Act, 1919, conferred general hiring powers upon local authorities trading in electricity; and this was a concession from former prohibition. But if a local authority could make out a special case showing that in the matter of the sale of such appliances the public in their administrative area were not sufficiently catered for by the local contractors, then it would be within the power of a Committee of Parliament to grant them selling powers. But the case would have to be a really sound one, as the 1919 Act obviously shows that the preference of Parliament in this matter of electric appliances is to confine local authorities to the hiring business. The application of the Corporation may not improve their relationships with the contractors, for the Committee were told that the needs of Wakefield in the selling of electric appliances had not been adequately provided for; and therefore the Corporation were justified in asking for powers. The contractors on the other hand, through their Counsel, eloquently and strenuously denied that their business keenness was at fault, or not of a high order. That is a matter of opinion; and no one can judge which side is right from a mere contest in bare assertion. Of course, there was also the well-worn argument as to the unfairness of competition, which is aided by ratepayers' money. Many gas companies might advance that argument very forcibly. However, the noble Lords were probably so bewildered by the wordy discussion that they came to the conclusion that the shortest cut out of the difficulty was to delete the offending clause. The Corporation have not therefore gained anything from their essay at circumventing the 1919 Act.

GLOVER-WEST NEW MODEL RETORTS.

Experience at Leigh (Lancs.).

Mention was made in the "Journal" for April 2 of the fact that the installation of Glover-West vertical retorts at York is of the "new model," which has previously been described in our pages. It consists in the Glover-West vertical retort of the usual elliptical cross-section, with the bottom portion opening out more or less abruptly into a circular section. By this simple expedient, not only is a greatly enlarged area of coke presented to the superheated steam for the simultaneous production of water gas in the retort, but the efficiency of the whole system is considerably increased.

The first installation of the "new model" retorts has now been working at Leigh (Lancs.) for an unbroken period of 26 months, steaming very heavily all the time, and yielding a very steady 250,000 c.ft. per day in the four retorts of which the installation consists. They are now let-down for inspection. With regard to this installation of retorts, the official organ of the West Gas Improvement Company Social Society says: "It is already evident that they are in excellent condition. It is particularly noteworthy that the steaming chamber itself looks 'as good as new.' The record of this retort is very instructive. The idea of the new design is fully set out in the patent specification, and those who read it will see that the root principle was to secure the benefits of steaming without retarding the ordinary process of carbonization in the upper portion of the retort. This object was fully achieved. But there was more. Without really lengthening the retort proper at all, there was an increase in carbonizing capacity of at least 50 p.ct. At the same time there was a great gain in flexibility. While, of course, the maximum efficiency was obtained at maximum capacity, Mr. Bowen found—and in the peculiar circumstances of the Leigh Gas-Works it was a valuable asset—that over short periods he could safely reduce the speed of working to an extent which we certainly did not anticipate when putting forward this design in the first place. This has been done without detriment to the retort, as the present inspection shows. There is no doubt, also, that the shape of the steaming chamber very materially facilitates the process of coke extraction, and establishes the Glover-West worm extractor without a rival. The 'new model' retort opens out a vista in carbonization practice which we have as yet by no means explored. Of course, it is impossible to do very much exploring of this kind under gas-works conditions. The gas supplied to the district has to be maintained, and the calorific value cannot be played with, neither can the make from one of three sets of gas-making apparatus be readily isolated. But now that we have our own experimental retort 'to play with,' we think that some extremely valuable data will be obtained."

Gas Oil.—The "Petroleum Times" reports that on the 7th inst. the price of gas oil was advanced ¼d. per gallon, making the price 5¾d. per gallon, net and naked, *ex* wharf.

The Vertical Retorts at Shrewsbury.—Some of our readers have been interested in ascertaining the identity of the system of vertical retorts dealt with in the paper by Mr. C. M. D. Belton, of Shrewsbury, before the Midland Association of Gas Engineers and Managers last month. The paper, with a report of the discussion, was published in our issue of March 19 [pp. 705 7]. The installation is on the Dempster-Toogood system, and was constructed by Messrs. Robert Dempster & Sons, Ltd., of Elland.

WATER-GAS PLANT AT AUCKLAND, NEW ZEALAND.

By James Lowe, M.Inst.C.E.

[A Paper read at a Meeting held in Wellington on Feb. 26, 1924, to form an Association of Gas Engineers in New Zealand.]

When it was suggested to me that I should read a short paper on the plant in use at Auckland for the manufacture of water gas, in conjunction with coal gas, I agreed; and I have pleasure in putting on record the working results of our Devonport Works, during January of this year. No special tests were made during January, and all I have been able to do is to make an excerpt from the ordinary working returns. I have chosen to give you Devonport results because the Auckland Works are not yet fully equipped with these water-gas plants.

Working Results during January, 1924, at the Devonport Gas-Works of the Auckland Gas Company, Ltd.

Gas-making plant in use—4 beds of 8's intermittent verticals, and one unit "Lowe" patent water-gas plant.

Duration of blowing and gas-making periods	=	3 minutes.	
		P.Ct.	
Coal carbonized: Maitland, N.S.W.		55	Resulting dry coke about 13 cwt. per ton.
Liverpool State Mine, N.Z.		40	
Taupiri slack (lignite)		5	
Quantity of coal carbonized	=	579·9 tons.	
Gas made	=	11,484,900 c.ft.	
Gas made per ton	=	19,804 c.ft.	
Calorific value	=	475 B.Th.U.	
Yield of therms per ton of coal carbonized	=	94	
Coke for sale	=	201 tons 11 cwt. (*minus* 6·95 cwt. per ton of coal carbonized).	
		Tons Cwt.	
Coke used for fuel in retort furnace	=	88 4 = 15·2 p.ct. of coal carbonized.	
Coke used in water-gas plant	=	84 8	
Grate area of each water-gas generator	=	16 sq. ft.	
Total grate area of both water-gas generators	=	32 sq. ft.	
Blast pressure under grates	=	3 in. W.G.	
Pressure in producer-gas ducts	=	1·5 in. W.G.	
Pressure in water-gas ducts	=	2 in. W.G.	

		P.Ct.	
Analysis of water gas made on Jan. 9	CO_2 =	6·3	Calculated calorific value, 311 B.Th.U. per c.ft.
	O_2 =	0·1	
	CO =	34·0	
	CH_4 =	3·4	
	H_2 =	50·5	
	N_2 =	5·7	
Analysis of blow gas made on Jan 9.	CO_2 =	8·8	Calculated calorific value, 85·4 B.Th.U. per c.ft. The quality of this gas shows that the blast pressure under the grate might be reduced, so that less coke would be burned in the water-gas plant.
	O_2 =	0·1	
	CO =	20·5	
	CH_4 =	0·3	
	H_2 =	4·5	
	N_2 =	65·8	
Analysis of town gas Nov. 5, 1923. (None made in January.)	CO_2 =	3·4	Calculated calorific value, 474 B.Th.U. per c.ft. Calorimeter, 480 B.Th.U. per c.ft.
	O_2 =	0·5	
	HC_n =	3·2	
	CO =	15·2	
	CH_4 =	24·38	
	H_2 =	36·6	
	N_2 =	16·72	

The CO_2 in the water gas is frequently as low as 3 p.ct. on the "W.R." CO_2 recorder.

The water-gas portion of the plant was put into operation about the end of May, 1923, and has continued to work without intermission since then. An account published in the "Journal" for Aug. 9, 1922, p. 324, explains the principles of the plant, so that I need not go into details on this occasion. Suffice it to say that it produces water gas and blow gas in continuous streams. This feature makes it possible to recover the heat usually lost in the blow gas by utilizing it for the heating of the coal-gas retorts, and it also makes it possible to introduce the hot water gas continuously into the vertical retorts; or, if the plant is used in combination with the horizontal retorts, the hot water gas may be introduced continuously into the foul main or elsewhere. The plant is automatic in action and requires no attendant. It is easy of regulation and responds at once to any slight adjustment of the steam-throttle or blast-throttle valves, whereby the output can be varied at will. Coke is charged into the hoppers once in 24 hours, but it may be done once a shift if desired. The plant is easy to clinker, in comparison with the usual water-gas plants (where a much higher blast pressure is used), and is very efficient, since radiation and unburnt fuel in the ashes are its only sources of loss of heat. At present, considerable avoidable loss due to unburnt coke in the ashes exists. An ash separator will shortly be installed, and the unburnt coke recovered from both producer and water-gas ashes.

The power required for automatic operation need cost nothing. Water from the town supply at 80 to 100 lbs. per sq. in. pressure is used at Devonport; and the water, after passing through the actuating cylinder, flows to the boiler-feed tank.

Very little power is required for actuation, because the gear is balanced, and it is only necessary to overcome friction. The water gas made is introduced at the bottom of the intermittent

vertical retorts; the ½-in. steam pipes formerly used for steaming having been superseded by 1¼-in. pipes. Any surplus water gas which the retorts will not take is admitted to the foul main through a governed entrance. The blow gases are introduced into each producer above the furnace door, and flow with the producer gas to the combustion chambers round the retorts. There is a saving of 33 p.ct. in the coke used for fuel in the retort furnaces in comparison with that used prior to the introduction of the blow gases. The figure was formerly 22·6 p.ct. of the coal carbonized, and is now 15·2 p.ct. Besides this, an unexpected result has taken place—the fires are easier to clinker. This easier clinkering was not experienced with the water-gas plant in conjunction with the Auckland horizontals, because the blow gases were not introduced into the producers, which are on one side of the retort bench only, but into the producer-gas duct from the side opposite the producers. The saving in coke by passing the hot blow gases direct into the producer furnaces is considerable, and it may to some extent be due to the reaction

$$4\,C + 2CO_2 + O_2 + N_2 = 6CO + N_2$$

described by Mr. Edward Crowther (see "Journal" for Oct. 31, 1923, p. 326). Mr. Crowther advocated the return of waste gases from the combustion chamber to the producer; but results of a similar nature may be expected from the introduction to a producer of blow gases containing CO_2. In view of this reaction, it might be advantageous to reduce the blast pressure in the water-gas plant, in order to increase the percentage of CO_2 in the blow gases. Corroborative figures have been obtained from the intermittent vertical installations at Auckland, which also show a saving of one-third of the coke since the introduction of the blow gases to the producers.

The De Brouwer coke conveyor is in the way of a similar introduction to the horizontals; but it is proposed to remodel the coke-handling arrangements, doing away with this conveyor. When this is done, there will be nothing in the way of the introduction of the blow gases to the producers of the horizontal bench.

When the system is applied to continuous vertical retorts, hot water gas, instead of steam, will be introduced at the bottom. With continuous verticals there will be continuous admission of hot gas, whereas with intermittents water gas is not admitted until two hours after charging. When steam is admitted to continuous vertical retorts, heat has to be supplied through the walls of the retorts, for the purpose of dissociating the steam. The material of which retorts are made is not a good conductor of heat. It is generally called "refractory," and the word refractory means that it offers resistance to, or breaks the passage of, heat. If the retort has to be used as a water-gas generator, as well as a carbonizing chamber, the heat which is generated by blowing, as well as the heat which is required for carbonization, has to be supplied through the walls of the retorts from the combustion chambers surrounding them. Consequently, much higher temperatures must be used, and much more fuel must be burned in the furnaces than that required for carbonization only.

After the residual heat in the coke has been utilized for the manufacture of water gas, that portion of the heat required for the production of a certain amount of water gas inside the retort will necessitate the burning of more coke in the producers of the retort setting than has to be consumed during the blow in a water-gas plant for the same production of gas, because, in the case of the retort, a shield of high resistance to the passage of heat has been interposed between the source of heat and the place where heat is required; whereas, in the case of the water-gas plant, the heat is generated where it is required. Heavy steaming must shorten the life of retorts by reason of the higher temperatures necessary, and by the disintegrating action of the steam upon the material of which the retort is made. Another result of heavy steaming is that there is great loss of heat in the waste gases, and also by radiation from the settings. These are the effects of the higher temperatures necessary when the retort is used as a water-gas generator.

The loss of heat in the waste gases has led to the introduction of waste-heat boilers. I recently had the opportunity of inspecting some installations of continuous retorts with waste-heat boilers; and I was not favourably impressed. I am inclined to agree with the opinion expressed in the Report of the Fuel Research Board on "Steaming in Vertical Retorts" that "No gas engineer could face with equanimity the prospect of the addition of a whole battery of boilers to his already complicated plant." I am of opinion that it is better and also cheaper to adopt a system which does not require the expense and complication of waste-heat boilers to render it economical in fuel—a system which will give at least equally good results in gaseous therms per ton, and in yields of ammonia and tar, and which will ensure the longest possible life for its retorts.

When I set out to design my water-gas plant, it was with the idea of bringing the results from intermittent vertical and horizontal retorts into line with those obtained from the continuous-vertical system and steaming. How far I have succeeded, the results which I have quoted to you to-day, and those which will be obtained from our Auckland Works when all the water-gas plants are completed, will enable you to form an opinion. With my system of water-gas plant in conjunction with continuous verticals, waste-heat boilers will not be so necessary.

In conclusion, I might say that the ultimate capacity of the Devonport water-gas plant is 400,000 c.ft. per day; but at present it is only being used to about one-third of its capacity. An extra-thick firebrick lining was built in the generators, which will be taken out later on to enable the maximum output to be obtained. It has been designed to work in conjunction with ten beds of eight intermittent retorts. The make per ton has occasionally been as high as 23,000 c.ft. of 475 B.Th.U. gas at our Devonport Works. After allowing for the saving in fuel by the utilization of the blow gases, it appears that the consumption of coke is about 22 lbs. per 1000 c.ft. of water gas made. Smaller units of the plant could be made for use with hand-charged horizontals, thus enabling small works to obtain results, in yield of therms per ton, which would compare favourably with larger works. For this purpose the plant could easily be built in a pit (say) 3 ft. deep alongside the retort-house floor, and the coke for charging could be wheeled up a ramp from the retort-house floor. It could be arranged to charge the hopper every shift; and the stoker could give the plant all the attention required without interfering with his other duties. In this way a plant of an ultimate capacity of 200,000 c.ft. per day might be installed for an output, to begin with, of only 50,000 c.ft. of water gas per day.

CHEMICAL TOPICS FROM CURRENT LITERATURE.

Notes from Recent Technical Publications.

By H. J. Hailstone.

Organic Compounds from Gases.

Further information on a fascinating subject appears in the "Berichte," in which F. Fischer and H. Tropsch give an account of the manufacture of organic compounds from the constituents of water gas. Carbon monoxide and hydrogen present are caused to react by heating in the presence of a catalyst, under pressure, water gas which is free from sulphur. An oily mixture containing numerous acids, aldehydes, alcohols, and ketones of the aliphatic series is produced; and to this product the name "synthol" is given. By heating this material under pressure, a mixture of liquid hydrocarbons is yielded; this being termed "synthin." A large amount of research work must be done before the mechanism of the various reactions involved is properly known; and this is being proceeded with. In the synthol reaction, pressures up to 150 atmospheres are used at 450° C., the catalyst being a mixture of iron and carbonate of potassium. The oily product distils between 100° and 200° C., and is converted into synthin at 400° to 450° C. in an atmosphere of nitrogen under pressure. Synthin distils between 50° and 270° C. In these reactions the relative proportions of carbon monoxide and hydrogen have a considerable effect upon the resulting product.

Gas Analysis.

In a research into the nature of the action of palladium and copper catalysts on mixtures of carbon monoxide and hydrogen, a need was experienced for an accurate method for determining the amounts of these gases in mixtures. In their description of the research, which appears in the Transactions of the Chemical Society, full particulars of the apparatus are given by Dr. Rideal and W. Hurst. The method, a physical one based upon the difference in heat conductivities of carbon monoxide and hydrogen, requires an elaborate and expensive apparatus. Heat, supplied to a platinum spiral and measured electrically, is dissipated by conduction through the surrounding gas mixture. Calibration is effected by comparison with control mixtures. The accuracy of the new apparatus is of a very high order, and the nature of the accomplishment will be well realized on reading that the gases can be estimated to within 0·05 p.ct. in so small a volume of the mixture as one eight-hundredth of a cubic centimetre.

A distillation method for analyzing coal gas is described by M. Shepherd and F. Porter in "Industrial and Engineering Chemistry." The measured gas is cooled by liquid air, and the nitrogen allowed to distil at −190° C., being collected and measured. Methane is fractionally distilled, and purified by repeated distillation, and the other various constituents separated, purified and measured in the same way.

Laboratory Distillations.

Owing to the difficulty experienced during the distillation of many substances, such as oils, &c., in preventing sudden and violent boiling of the contents of the flask, several precautions have been suggested for overcoming the trouble. One of these consists in rotating the flask in order to prevent any local superheating. In the Journal of the Chemical Society, H. G. Becker describes a convenient device whereby the flask, fitted with a pulley, may be rotated by suitable means. The flask is connected to a fixed distillation head by means of a well-greased long ground joint. On reducing the pressure, this joint is secure from leakage, and any seizing is prevented by the shoulder provided.

Surface-Tension Determinations.

In the Transactions of the Chemical Society, S. Sugden describes a compact apparatus suitable for the determination of surface tensions of liquids at various temperatures. It consists of a tube into which two air tubes are fitted, one drawn out to a capillary and the other fitted with a stopcock. A gauge filled with coloured alcohol, and a mercury aspirator complete the set.

Observation is made of the difference in pressure required to liberate bubbles from the two tubes when immersed in the liquid under test. Pure benzene is used for calibration, a formula and a table being published giving the surface tension values for this material at different temperatures.

Corrosion

An account by U. R. Evans in "Chemistry and Industry" gives an excellent explanation of metallic corrosion from an electrochemical point of view. By former experiments Mr. Evans had shown that an electric current may be set up by two pieces of similar metal immersed in the same solution when a current of air is allowed to bubble over one of these pieces. It is rather surprising to find that the bulk of the corrosion taking place during such an experiment occurs at the surface of the un-aerated metal. This gives us a good idea of what happens when "pitting" takes place on an iron plate—as, for instance, a gasholder sheet. Assuming a small cavity to be formed on the surface of the wet iron sheet, or, alternatively, a spot loosely covered with rust, access of air will be considerably restricted at these places, and the metal will be further corroded away by the electrolytic action referred to. Since the areas of attack are small, the corrosion at such points is comparatively all the more severe. A little thought on this explanation seems to throw light on many practical instances of corrosion that occur all too frequently in gas-works.

Soft Soldering.

An introductory account of research work into the nature of soft soldering is given in the Journal of the Society of Chemical Industry by T. B. Crow. The many variables in the conditions of manipulation and materials employed are studied, and it is demonstrated that joints having the thinnest film of solder are the strongest. When investigating the effect of temperature of soldering, it was seen that, under the conditions of the experiments, a definite temperature could be determined, which gave optimum strength, while joints made at higher heats were weaker. In considering the action of fluxes, it was found that their function is to keep the metal surfaces clean and unoxidized. The diffusion of the tin of the solder into the copper test-pieces is well illustrated by microphotographs. Further study is proceeding.

Heat Insulation.

The Celite Products Corporation, of Victoria Street, London, have issued a series of Bulletins dealing with the subject of heat insulation; and though these deal chiefly with various products marketed under the trade name "Sil-O-Cel," they give many practical references to heat transmission and insulation problems. Graphs and data showing the temperature losses in furnace and oven walls, boiler flues, &c., with and without insulation, stimulate curiosity as to the efficacy of the various refractory materials on the market, and indicate lines on which comparative tests might well be made. Full references are given to many valuable technical communications (mainly American) dealing with this phase of the subject of heat economy.

Surface Treatment of Concrete.

Under the heading "Research Items," "Nature" draws attention to several processes that have resulted from studies of the problems of concrete mixing and laying. The use of silicate of soda, calcium chloride, and slaked lime has brought about considerable improvement in concrete work. Powdered calcium chloride is employed to keep the surface of new work moist during setting, and obviates the covering with damp soil or water, as is often necessary. When mixed with the cement, it causes quicker hardening and increased strength, as also does sodium silicate. With regard to the use of this latter ingredient, considerable information on the subject is given in pamphlets issued by Messrs. Brunner, Mond, & Co., which indicate the results to be expected by applying silicate for hardening and waterproofing. From a study of the reactions involved, and the consequent effect on the strength of the concrete, it is clear that this treatment will be of interest where hard and waterproof floors are necessary, as in retort-houses, sulphate plants, oil stores, &c. With silicate of the definite composition advised, there would appear to be little difficulty in obtaining good results by following the suggestions. Useful experimental data are included showing the effect of the treatment, and also a list of references to literature on the subject. While dealing with concrete, reference might be made to the account of its behaviour under centrifugal action given before the Nottingham Section of the Society of Chemical Industry by Mr. G. J. Ward of the Stanton Iron Works. That careful selection and apportioning of the cement and aggregate are important factors when manufacturing concrete or lining iron pipes with concrete by the "spinning" process, will be readily understood. The speed of rotation, the rate of filling, and the period of spinning, must all be carefully controlled in order that the various particles of material may be distributed where required.

Society of Chemical Industry.—The annual general meeting of the Society is to be held in Liverpool from July 9 to 12 inclusive. On the opening day Dr. E. Frankland Armstrong, F.R.S., will deliver his Presidential Address. The annual dinner will take place in the Midland Adelphi Hotel on July 10.

THE CORROSION OF IRON.

[An Abstract of a Paper by Dr. J. Newton Friend, read before the West of Scotland Iron and Steel Institute.]

Theories of Corrosion.

Any satisfactory theory of corrosion must be capable of explaining the following facts, which have been definitely established beyond dispute: Iron does not rust in dry air, in pure water in the absence of air, in moist air at constant temperature, or in steam. Hence, in order that rust may form, iron must pass into solution.

The Acid Theory.

According to this, which was summarized by Calvert in 1871, oxygen and pure water cannot by themselves induce the corrosion of iron; an additional substance must be present to enable the iron first to pass into solution. Since in most cases of natural corrosion carbonic acid is one of the chief accelerators of the reaction, the changes taking place may be represented by the following equations:

$$Fe + 2CO_2 + 2H_2O = FeH_2(CO_3)_2 + 2H$$
$$Fe\,H_2(CO_3)_2 + Aq = FeO\,Aq + H_2O + 2CO_2$$
$$4FeO\,Aq + O_2 = 2Fe_2O_3\,Aq$$

The nascent hydrogen liberated in accordance with the first equation combines with dissolved oxygen to form water. The carbon dioxide liberated by the hydrolytic decomposition of ferrous bicarbonate, as shown in the second equation, is free to attack more iron. Thus, a small quantity of acid is able to assist catalytically in the oxidation of an indefinite quantity of metal. The presence of free acid is not essential, for neutral salts, such as sodium chloride, even when rendered faintly alkaline, readily stimulate corrosion. In other words, small quantities of an electrolyte are necessary.

In 1903 Whitney pointed out that, water being an electrolyte, and therefore split-up to a small extent into hydrogen and hydroxyl ions, it was unnecessary to postulate the existence of a catalyst before corrosion could take place. Whitney's theory is frequently termed the "electrolytic" theory of corrosion. This has led to confusion, because, by implication, the acid theory is not to be regarded as electrolytic. In point of fact, both theories will bear equally well the electrolytic interpretation. Moody has shown that pure iron, water, and oxygen do not interact. The modern theory, therefore, postulates the presence of an electrolyte in the water, in order to effect the solution of the iron—a necessary prelude to corrosion. Valuable as this theory has proved to be, it is not by itself sufficient to account for all the phenomena connected with the corrosion of iron.

The Colloid Theory.

As none of the recognized theories could account for the anomalies observed, it was evident that a new and more comprehensive theory was required. The author was, therefore, led to suggest the following, according to which:

(1) On coming into contact with air and liquid water, iron is slowly oxidized to ferrous hydroxide. This compound, however, is produced in the colloidal, or sol, condition—a state in which it is usual for many substances to be fairly reactive chemically.

(2) The colloidal ferrous hydroxide oxidizes in excess of air to a higher hydroxide, still in colloidal form. Under favourable conditions, this higher oxide will be ferric hydroxide; in less favourable circumstances, colloidal ferroso-ferric hydroxide, Fe_3O_4 Aq, will be formed.

(3) This higher colloidal hydroxide now catalytically accelerates the oxidation of the iron possibly by acting as a depolarizer. It simultaneously undergoes reduction to a lower colloidal hydroxide, only to be oxidized again as oxygen from the air diffuses towards it.

(4) When the sol precipitates out, ordinary rust is produced.

Influence of Dissolved Salts.

As a general rule, if a small quantity of an inorganic salt is dissolved in water in which iron is corroding, the rate of corrosion is increased. The rate increases with the salt concentration until a maximum is reached, termed the critical concentration. Further concentrations reduce the corrosion, which may ultimately fall to *nil* at the limiting concentration. In the majority of cases the solution becomes saturated with the salt long before the limiting concentration is reached. Solutions of sodium carbonate retard the corrosion. According to the acid theory, this is due to the salt absorbing any atmospheric carbon dioxide, yielding the bicarbonate, $NaHCO_3$, so that there is no free carbon dioxide to act as a catalyst. Whitney's theory explains the phenomenon on the ground of hydrolytic dissociation; the presence of the hydroxyl ions exerting a kind of back pressure and preventing the necessary reaction from occurring. Ammonium salts generally increase the corrosion very much, undoubtedly owing to hydrolysis.

Influence of Temperature.

The rates at which the majority of chemical reactions will take place are increased by raising the temperature. In the case of the corrosion of iron submerged in water or aqueous solutions, however, several factors come into play. For instance, rise of temperature reduces the oxygen solubility, thereby tending to retard corrosion. It increases the rate of evaporation, with the same

effect, and tends to precipitate the catalyzing sol. On the other hand, the enhanced rate of chemical reaction far outweighs these factors. Experiments carried out by the author show that the temperature-corrosion curve is parabolic. The rise in corrosive action between 0° and 10° C. is negligently small, from 15° C. upwards the rate is roughly proportional to the temperature, and at 80° C. iron corrodes about seven times as rapidly as at 0° C.

THE PRESENT POSITION OF THE GAS INDUSTRY.

By a Gas Engineer.

[With the opinions expressed in this series of articles, the Editor of the "Journal" does not necessarily associate himself.]

Gas Apparatus.

Almost, if not quite, equal importance to a good supply and quality of gas is the apparatus in which it is to be consumed. Nobody with any experience in the distribution of gas can deny that in the design of apparatus intended to be used for domestic purposes there is as much need for improvement as in anything else connected with the gas industry. The fault, perhaps, does not entirely rest with the makers, as they have always been handicapped—now probably more than ever—by the quality of gas supplied varying throughout the country.

The great evil connected with the therm system is that it perpetuates this inequality of values; and the manufacturer has to design apparatus which will deal with gas varying from 400 to 600 B.Th.U., and occasionally with an even greater difference. The ability to declare and make what quality of gas a company may think most suitable undoubtedly has great advantages from a manufacturing point of view; but it is doubtful whether the gain on the manufacturing side is not more than counterbalanced by the loss sustained in distribution. Possibly at some not very distant date the gas industry will agree upon a universal quality or at any rate limit the variation, and so remove one of the great difficulties of designers of gas-apparatus whether for domestic or industrial purposes. Until that time arrives the manufacturer must accept the conditions that now exist, and, working in conjunction with the remainder of the industry, must design and supply apparatus that will deal as efficiently as possible with the varying qualities and pressures supplied by gas undertakings.

English manufacturers have long held a reputation for the finest heavy machinery and tools in the world, and the makers of apparatus for the use of gas for industrial purposes and high-power lighting have fully maintained this reputation. Gas-engines, gas-furnaces, high-pressure lamps, &c., made in English works need not fear comparison in any way with foreign makes; and for efficiency and durability they probably have no equal. The only criticism which comes readily to mind in connection with the supply of industrial or similar apparatus is that the small and amateur user is somewhat neglected. The big lathe makers think it worth their while to make special lathes, issue special catalogues, and inaugurate advertising campaigns for the sole benefit of amateur workers. Surely more might be done in this line by the manufacturers of gas apparatus. It must be admitted that in this respect very little assistance has been given by the executive heads of the gas undertakings.

While giving almost unlimited credit to the manufacturer for the work done in the industrial sphere, he has not been nearly so successful in the design of apparatus intended for the use of gas for household lighting and other domestic use. Probably the reason for the great success in one sphere and the comparative non-success in the other is psychological. In industrial work you have a man's mind working for man's requirements, whereas domestic gas-apparatus ought to be designed more with a view to woman's desires and convenience. Moreover, industrial apparatus is generally designed to fulfil a definite and known want, in which efficiency, durability, and price, in the order of importance named, are the main factors to be considered. With domestic apparatus, on the other hand, the main factors which tend towards success vary almost with every piece of apparatus designed; and the capabilities of the possible users have to be considered. Without going into too great detail, it will be an advantage to discuss separately a few of the different classes of apparatus now in general use for domestic purposes.

Burners.

Apart from the shoddy stuff with which the market is flooded, the type of burner now supplied is unworthy of the industry. Looking back over the last thirty years, since the advent of the incandescent mantle, it seems strange that so little improvement has been made. Probably it is in this type of apparatus that the manufacturer has felt most the handicap of the varying qualities and pressures of the gas supplied. The lighting efficiency of the best makes of burner now on the market is good, but generally speaking the burners are flimsy, ugly, and almost impossible to regulate. With few exceptions any burner, after being in use for a short time, looks decrepit, and more fit for an outhouse than for a living room. The advent of the aluminium burner with the vitreosil globe marked a distinct advance; and it is probably on these lines that some greater improvement may be made, unless it is found possible to make the body of the burner itself of vitreosil.

The regulation of the present-day inverted burner is almost an impossibility, as proper regulation can only be effected when the burner is in use and, consequently, very hot. The regulators are usually flimsy and get into bad repair long before the remainder of the burner is worn out. The writer many years ago suggested to different makers that spindles should be provided for this purpose, so that a loose clock key could be used for the regulation. This would be especially valuable with street and cluster lamps. Nearly twenty years ago an attempt was made to design a burner with the gas-regulator and air inlet well away from the burner itself; and, unless there is some insuperable objection to this, it seems a pity that the idea was not followed up. The clumsiness of the present-day burner, compared with what it might be, can best be illustrated by likening it to the difference between railway refreshment room tea cups and the delicate china used in private drawing-rooms.

The requirements of a burner for domestic use are: Good and dainty appearance; ease of regulation (if composition of the gas permits—regulation to be at the main tap of the bracket or pendant); simplicity of parts (by this is meant that the burner should be capable of being taken to pieces for cleaning purposes and reassembled easily by untrained hands); strong and durable, without being clumsy—should be made of material able to withstand the corrosive action of the escaping fumes; good lighting efficiency (as the absolute lighting efficiency of the gas-mantle is so high, a reasonable percentage can be sacrificed in order to obtain better general results); and reasonable, but not necessarily very low, price. Fancy moulding and projections of any sort should be avoided as far as possible, so as to prevent the accumulation of dust; and there should be only two sizes—bijou and ordinary. The comparative low intensity of the light per unit of the lighting surface of the gas mantle as compared with the electric filament lamp is an asset in favour of gas lighting of which the industry has not taken sufficient advantage.

Gas-Fires.

"A bad report runs a thousand miles a minute," says an old Oriental proverb; and the old and deservedly bad reports of gas-fires have travelled so fast and far that it has been impossible to catch them up. The increasing demand for gas-fires for all purposes is mainly due to their convenience; and as far as private houses are concerned, the servant problem has largely contributed to their apparent success. It would be a mistake to shut our eyes to the fact that, apart from their convenience, gas-fires are not popular with either the public or the doctors. The reasons for this dislike are twofold. The impression of the old defects still exists in the minds of the public, and, further, gas-fires still have defects which weigh when comparing them with coal fires.

As compared with a coal fire, the heat given off by a gas-fire is more intense and its effect upon the atmosphere in the room seems to be more confined to the area covered by the direct rays from the heated surface. It is possible to stand in front of one of the modern gas-fires fitted with a reflecting trivet and have your shins scorched, while at the same time your feet are freezing—and this not only just after the fire is lighted, but some time afterwards. Though immense strides have been made generally during the last few years, this difficulty remains, and almost seems intensified in the modern makes. Whether the dryness of the atmosphere which so many people allege is the result of gas-fire heating is fact or fancy, remains open to argument. It is, however, widely believed; and this belief is a considerable deterrent to their popularity.

The main factors to be considered in a gas-fire are: Efficiency, appearance and upkeep, and cost. The order of importance of these three varies according to the use to which the fire is to be put. There is no doubt but that the makers are and have been doing everything in their power to increase the heating efficiency of gas-fires; and there is even a danger that they have been doing this at the expense of general utility. It has been urged that there is too much laboratory work and too little common sense. Until recently the general appearance of all gas-fires was ugly, and did not fit in with any style of household architecture. Very ugly things have often a charm of their own, but gas-fires had not even this redeeming feature; and when fixed, as was usually the case, with a black sheet-iron back to fit the coal grate, it was difficult to imagine anything more unsuitable for a decently-furnished bedroom or sitting-room. Owing to the initiative of one or two of the largest makers, a wonderful improvement has been made in the last few years; but this is almost altogether confined to the higher-class fire. Surely the time has come for the old patterns to be ruthlessly scrapped, and for the cheaper fires to be designed upon more artistic lines.

If anyone examines a gas-fire which has had a reasonable amount of use about three months after it has been fixed, he will find that there is considerable room for improvement. Broken fire-backs, irregular and dirty fuel, and bent fuel bars, combined with a dirty deposit over all, do not improve the appearance, more particularly if fixed in a well-furnished living-room or bedroom. It is not suggested that all gas-fires exhibit the whole of the above defects, but usually some are apparent. Improvement of the fire-backs is a matter of some importance; and whether a simple remedy can be found must be left to the makers. One fault common to many of the latest fires is that too much of the fire-back is exposed. Irregular and badly-shaped fuel is cap-

able of amendment, as is proved by the fact that some makes of fuel fit exactly, and when in position form a perfectly straight edge along the top. In the writer's house there are two gas-fires in adjoining rooms; in one of them the fuel is properly shaped and level, in the other it is very much the reverse. There is no excuse for bent fuel bars. One maker is particularly guilty in this respect. It is by no means difficult to find fires of this make with the fuel bar so bent forward that the top pieces of fuel slip down behind the upright pieces. Would it not be possible to design a fire with the front slightly curved out from the sides to the centre and also slightly curved out from the top and bottom towards the centre? If this could be managed, it would do something towards distributing the heat more generally. No fire which is intended to be fixed in a room where people sit round the hearth should have a reflecting trivet. With regard to the cost of the actual fire it cannot be said that it is excessive. While every effort should be made to keep the cost down to the lowest possible figure consistent with a good article, the present price is hardly likely to prevent any consumer who wants a fire from obtaining one.

Gas-Cookers.

The simple-hire system in connection with gas-cookers is undoubtedly the main cause for the great growth in their use; and at the time it was started it was probably the only method by which any considerable number of people could be persuaded to adopt them. As against this, however, the system delayed for a generation any real progress, and in a way standardized an inferior type. The reasons for this are fairly obvious, as gas undertakings had sunk a lot of capital in gas-cookers, and it required a very strong inducement to persuade them, even if the manufacturer had any wish to do so, to change the cooker they were in the habit of supplying. The makers on their part had a steady demand for a standard article, and it was not to their advantage to do much more than satisfy it. Generally speaking, each of the large firms of manufacturers had its own particular set of customers, as few managers cared to stock more than one make, especially as there was little to choose between any of them, and it meant keeping more than one set of spares.

There is no necessity to go into the reasons for it, but a few years ago a new spirit of competition arose and a better-finished cooker was put upon the market, and gas undertakings were compelled to stock it for sale. The improvements were not very real, as, apart from appearance, removable burners, and ease of cleaning, there was little to choose between the new cooker and the old types which had been in use for well over twenty years.

The prices of many of the cooker accessories are too high. If anybody wants a plate-warming cupboard, he has to pay about three guineas for it. Why not make a plain sheet-steel cupboard, to be fixed above the cooker and with the flue pipe from the oven connected to it, and sell it at a reasonable price? This would be more useful and save more gas than all the devices on the latest types of cooker. The arrangement of the burners on the hot-plates of even the best of cookers is bad, and the hotplate is usually too small for the work. The remedy for this is to sell the oven and the hotplate separately; and if there is not room for the hotplate where the oven is to be fixed, fix it somewhere else. An oven with a plate-warming cupboard on the top is a complete and useful piece of apparatus; and the hotplate could be designed without reference to the size and shape of the oven. A further advantage would be that the oven could be fixed at just the right height for convenient use, as also could the hotplate.

Before any cooker is put on the market it ought to be tested—not in a laboratory, but by independent women cooks for a period of not less than three months. These cooks ought not to be selected by the makers, but by some independent body, and should make their tests without knowledge of what the others are doing, and submit written opinions to the authorities who selected them. Such tests would have real value. As cookers are mostly used by women, surely it would be good policy to take advantage of their experience and knowledge, not after, but before, the fact. As so many new houses will have to be built in the near future, would it not be possible to design an oven which could be built into the walls close to the chimney breast, so that the flue outlet could connect into the chimney, and so remove the reproach that the waste fumes escape into the room?

Geysers and Water Heaters.

The quality and efficiency of the geysers now on the market is very high; but for the sake of the housewife it is suggested that a greater point should be made of the chocolate finish, which saves the continual cleaning and polishing now necessary. The only criticism the writer is going to make is in reference to the automatic gas and water valve, which is a real source of danger. When the valve is in good working order, it is a great advantage; but should it go wrong there is the danger of the gas going out when the water shuts off, and going on again unlighted if the water comes on again. There are two suggestions to be made with a view to making things safe: (1) No automatic valve should be used unless there is an independent by-pass. (2) The water supply to all geysers should be connected from an overhead tank, so as to maintain a constant pressure. In no circumstances should the water supply to a geyser be connected direct to the ordinary house supply.

While hardly coming within the purview of this article, the fixing of geysers by outside gasfitters, and very occasionally also by gas companies' men, shows an appalling lack of either knowledge or care. One case came to the writer's knowledge some years ago when in a new house the flue outlet to a geyser was taken into a hollow wall. The result was that half the wall was blown out. Every geyser, after it has been fixed, should be inspected and passed by someone with knowledge. The water heaters now sold are most useful, and if more widely known and advertised would have a much larger sale. The water heaters fixed with a thermostat have the same fault as the geysers fitted with an automatic valve, and should never be fixed without an independent by-pass. After one of these water heaters has been in use for some time, the action of the thermostat in reducing the quantity of gas goes too far, and puts it out (helped often by a puff of wind), with the result that, when the water cools, the gas comes on again unlighted. Hot-water circulators have reached such a high state of efficiency that any complaints must be the fault of those who fix them wrongly or in unsuitable places, or, what is worse, recommend a circulator too small for the work.

There is neither time nor space to deal with the smaller types of apparatus, which on the whole are far from being a credit to the imagination or the common sense of the makers. There are, however, two appliances which, if properly designed, should command a much greater sale than they now do. These are gas-toasters and gas-irons. The finest piece of apparatus for making toast is the gas-fire; and none of the ostensible gas-toasters approach it either for efficiency or convenience. Surely a toaster could be designed which would more nearly approximate to the efficiency of a gas-fire. The gas-irons now on sale are far from perfect. There is only one real test for a gas-iron—whether it will iron heavy and wet clothes. If it will do this, it will do anything. Out of about eight gas-irons in the writer's house there is only one that will comply with the test—and that only when there is a pressure of gas of over 4 in. The cleaning and regulating arrangements in nearly all gas-irons could be greatly improved.

As far as this article is concerned, there is only one other point which it is wished to raise, and that is whether some body connected with the industry should undertake the testing and certifying of all gas apparatus. There is much to be said in favour of such a scheme. The great advantage would be that it would stamp the shoddy stuff now being sold; and if gas undertakings refused to deal in any article which did not receive the official certificate, it would raise the average standard of quality immensely. The tests to which the apparatus would have to be submitted would be for efficiency, safety, and durability, and would have to be real working tests and not laboratory experiments. Whether some organization in the industry would undertake the work, is a matter for discussion; and if space had permitted, the writer would have liked to elaborate the idea. Apparatus manufacturers have done much to bring the gas industry to its present state of prosperity; but much more requires to be done. If all work together, there seems no reason why, in the course of a very few years, the quantity of gas apparatus now in use should not be doubled, or even more than doubled.

The Importance of Good Lighting in Public Service and Industry.

The British Broadcasting Company, who arranged for the dissemination of a talk on lighting, by Mr. Leon Gaster, in December last, again did good service by furnishing an opportunity for an address on the above subject on April 14. Whereas the first "talk" dealt chiefly with domestic lighting, on this occasion Mr. Gaster referred to the illumination of streets and factories. The duties to be performed by modern street lighting, he pointed out, were more complex than in the past. The great increase in motor traffic, with its attendant roll of accidents, renders good public lighting an elementary precaution in the interests of safety. Good lighting of a city should be a matter of civic pride, and ample illumination in streets would render powerful motor-headlights unnecessary. He looked forward to the day when the lighting of roads would be considered jointly with the upkeep of surface, and treated not as a parochial, but as a national, matter. In connection with factory lighting, Mr. Gaster again pointed out the need for good illumination in the interests of safety, and referred to the prospect that there would be a provision requiring adequate lighting in the next Factory Act. The cost of good illumination was usually not more than 1 p.ct. of the wages bill, and modern advances in gas and electric lighting enabled them to obtain light far more cheaply than in the past.

Progress of Applied Chemistry.—We have received a copy of the 1923 volume of "Annual Reports of the Society of Chemical Industry on the Progress of Applied Chemistry," edited by Mr. T. F. Burton. The section on "Fuel" is by Mr. E. C. Evans, B.Sc., F.I.C., M.Inst.M.E., and that on "Gas, Destructive Distillation, and Tar Products" by Messrs. F. M. Potter, M.B.E., B.Sc., A.R.C.S., F.I.C., and D. Ivor James, M.A.

New Gas-Works for Prague.—The "Prager Presse" states that the contract for the erection of the new Prague Gas-Works will be given to the French firm of Duval, while the plant and machinery will be supplied by home concerns—notably the Skoda Works (who will receive a contract for kc. 40,000,000), the Vitkovice Iron-Works, Breitfeld and Danek, the West Bohemian Brick and Tile Works, and the Rakovnice Chamoote Works. The cost of construction will amount to upwards of kc. 150,000,000.

GLOVER-WEST WORKING RESULTS AT CARLISLE.

A Four Years' Comparison.

In his Presidential Address to the North of England Gas Managers' Association, in October, 1922, Mr. J. E. Blundell, Gas Engineer and Manager at Carlisle, described the new Rome Street Gas-Works of the Corporation, which were formally inaugurated on the day of the meeting of the Association in the city. The retort-bench, he explained then, consists of eight settings containing 64 Glover-West vertical retorts, each setting provided with a chimney, and each chimney provided with a waste-heat boiler for supplying the steam for introduction to the retorts. Mr. Blundell now forwards a copy of the comparative working results for the past four years (first carbonizing at the old works, and then at Rome Street), from which the increased efficiency obtained under the new system can be clearly seen.

Year 1920–21.—At old works.
" 1921–22.—Coal strike April, May, and June, 1921.
" 1922–23.—First six months (April to September) at old works; second six months (September to March) at new works.
" 1923–24.—At new works (Glover-West continuous vertical retorts).

—	Year March 31, 1920–21.	Year March 31, 1921–22.	Year March 31, 1922–23.	Year March 31, 1923–24.
Gas made . . . . . c.ft.	432,215,000	431,054,000	415,641,000	453,390,000
Coal used . . . . . tons	38,099	32,813	27,642	24,205
Oil used . . . . . gallons	12,976	118,124	41,567	*Nil*
Make of gas per ton of coal carbonized . . . . . c.ft.	11,223	11,777	14,376	18,731
Calorific value of gas per c.ft. . . . . B.Th.U.	477	455	471	450
Coke made . . . . . tons	29,921	25,476	18,760	17,016
" " per ton coal carbonized . . . . . cwt.	15·7	15·52	13·57	14·0
" sold* . . . . . tons	23,353	18,687	13,458	10,792
" " per ton coal carbonized . . . . . cwt.	12·2	11·39	9·73	8·9
Tar made . . . . . tons	2,050	1,722	1,675	1,994
" " per ton coal carbonized . . . . . gallons	10·76	10 49	12·12	16·4
Sulphate of ammonia made . . . . . tons	283	225	296	344
" " " per ton of coal carbonized. . . . . lbs.	16·6	15·35	23·95	31·8
Gas heat produced per ton of coal carbonized . . . . . therms	53·53	53·58	67·71	84·28

*This is actually sold over the weighing-machine.

The price of gas has been reduced 1s. 6d. per 1000 c.ft. during the past financial year, and is now 3s. 6d.

MIDLAND JUNIOR GAS ASSOCIATION.

A meeting of the Association was held in the Council House, Birmingham, on Thursday, April 10—Mr. L. H. Thomas presiding—at which the following paper was read.

NOTES ON THE AMERICAN GAS AND COKE INDUSTRY.

By F. S. Townend, B.Sc., of London.

The gas industry in America has followed lines of development somewhat different from those in England. Two factors, both absent here, have up till recently governed gas practice—the first being the supplies of natural gas, and the second the supplies of cheap oil. The former, being produced at almost nominal cost, is pumped scores of miles far outside the immediate district where it is found. Its high calorific value of 1000 B.Th.U. makes it very cheap to distribute; and where it can be had, it is used for every purpose—domestic lighting, cooking, heating, steam raising, and metallurgical work. In Pittsburgh it is sold for 50 cents (about 2s.) per 1000 c.ft.—about 2½d. per therm. Natural gas is, however, a wasting asset, and gas men are considering what form of gas will take its place when the supply is exhausted. The supply of cheap oil has allowed of a large growth of carburetted water-gas manufacture, and there are many places which are supplied entirely by this gas. Its use creates a market which is non-existent over here—that is, an open market where the water-gas undertakings buy their own coke from coke-ovens and gas-plants.

A third factor of importance is the almost universal employment of central heating in houses and other buildings. Anthracite has been, and is, largely used as the fuel for this purpose. The gradual increase in price as available reserves are utilized, and the fact that coke can be obtained cleaner than a great deal of the anthracite, have led to an increased demand for coke. There is thus a fair balance of demand for gas and coke, which is not always found in England. Further, gas men seem to consider that a denser coke, which gives a greater weight per c.ft., is what is required for domestic use, and that the provision of an open, free-burning, light coke may have a restricted application. Indeed, they are pessimistic of the use of a low-temperature coke when it is provided. The fact that existing fittings and cookers are designed for high-quality gas, and there is this demand for coke, is apparently leading the gas industry into adopting the manufacture of a straight coal gas with a high yield of coke.

All the usual types of carbonizing apparatus are to be found in the States. The author does not intend to describe in detail the various types he has seen, but rather to pick-out points of interest in construction and operation, particularly those which seem worthy of adoption on this side. A reference, however, to the latest development may be of interest; this is the use of small coke-ovens for gas manufacture.

Coke-Ovens for Gas-Works.

There are several of these plants being built, and one at Battle Creek (Mich.) has been working some months. It consists of eleven Becker type ovens, 14 in. wide, 26 ft. long, and 10 ft. 10 in. high, holding a charge of 6·1 tons. The oven is fitted with self-sealing doors, and is filled through charging holes in the top. A small pushing machine runs along one side of the battery, and on the other side the coke drops into a quenching car, by which it is taken to a quenching station. The heating of the ovens is carried out by producer gas; the gas and air burning on one side of the oven and passing over the top at three points, and thence down the other side to heat the regenerators. Reversal of this flow takes place every half-hour.

The time of coking is 12 hours; and each oven therefore handles 12·2 tons per day. The producer gas is made in a Koppers-Kerpely producer with conical grate, mechanically rotated. The fuel used is a mixture of nuts and breeze, and contains up to 20 p.ct. through ¼ in. Gas made is about 74 therms per ton, of a calorific value of 560 B.Th.U. without steaming Provision is made for steaming by having holes in the floor of the oven.

Coal and Coke Handling.

There are many items under this head which are not usual in this country. Coal cars contain from 50 to 100 tons. They are of steel, and frequently have hopper bottoms. This point of handling coal in larger quantities than 12 tons is really of great importance. It is as easy to discharge by hopper-bottom trucks, or by tippler, 70 tons as 12 tons; and considering the reduction in shunting, and the less space occupied on the works by a train of large cars, it is much cheaper to handle coal in large lots. It is realized that the question of the increase of car capacity, with increased axle loads, is wrapped up with railway construction and the colliery facilities. Nevertheless, the upward trend in this country is to be encouraged; and it will undoubtedly pay gas undertakings to arrange to take full advantage of large coal trucks.

Belt conveyors are largely used with both coal and coke, and, except in special circumstances, are becoming the standard. They are undoubtedly the best for large capacities. Working on coal, their life is very long, as there is no sliding wear, and no steel links and pins which cause so much repair work with metal conveyors. With coke the life is considerably shorter, as any hot spots in the coke, or any water drippings make the condition very arduous.

The following figures may be of interest: Coal conveyor, 300 tons per hour, life 7,000,000 tons. Coke conveyor, 240 tons per hour, life 1,000,000 tons. In coke-oven practice, not only are horizontal belts used, but, almost without exception, belts on the incline transfer the coal from the truck hopper to the coal bins. You will agree that most forms of elevators and conveyors demand unceasing maintenance; and the saving in this respect alone is considerable. An important advantage when handling coke is possessed, for, the coke being quiescent on the belt, breakage is reduced to a minimum.

Coke Screening.

The most modern plants use any or all of three types of

screens: (1) Rotary grizzlies; (2) shaking screens; and (3) vibrating screens.

The rotary grizzly is used on sizes down to about 1 in. It consists of a series of six or eight axles, each carrying discs set at the distance apart to which it is desired to screen the coke. These axles are set parallel to each other on an incline, with the discs just touching; thus between the discs and axles there are holes which allow the under size to pass through. The axles are rotated, and draw the coke over the screen. The merits of this apparatus are: (1) High throughput; (2) clean screening; and (3) low repairs.

Shaking screens are well known here, and require no description. They are used on sizes from 2 in. down to ½ in. Vibrating screens are employed to a fair extent on the smaller sizes. The Hummer and Mitchell screens are the chief forms. The former consists of a unit comprising a wire screen 4 ft. wide stretched tightly on a frame. This frame is bolted in the frame of the screen itself. The stretched wire screen is vibrated rapidly by an electro-magnet fastened above it. This class of apparatus is used on 2 in. downwards, but proves its superiority completely on the smaller sizes down to ¼ in.

In loading coke into cars—particularly furnace coke—use is made of the boom conveyor, which is a belt conveyor on a movable arm that can be raised or lowered. Thus, as the car is filled, the arm is raised and the drop of the coke avoided.

One other point is of interest. It is the practice to measure the coal going into the retorts or ovens. The carrying cars or charging cars generally receive the coal while standing on a weighing machine; or they themselves are built as weighing machines. This principle has been adopted in England to a slight extent. In order to make best use of carbonizing capacity such an arrangement is necessary, and an extension of the practice is desirable.

Silica Settings.

The author did not see any firebrick settings. Horizontal retorts, verticals, and coke-ovens were entirely made of a 95 p.ct. silica brick. There seems to be some prejudice in England against using silica—due, it would appear, to unfortunate experiences when silica and firebricks were used without experience in the same setting, and before a good silica brick was obtainable in this country.

It must be said immediately that the use of *all* silica is entirely successful. The merits lie in: (1) Long life; (2) higher heat transmission; (3) freedom from attack by salts in the coal; and (4) they stand higher temperatures. When all is said against silica brick settings, their undoubted long life justifies their adoption.

The author has seen coke-ovens and intermittent verticals which have been at work for seven years, and more, without any repairs, the walls still being almost as good as new. There is one installation which has been at work since 1908, without any resetting. When asked the life of a silica setting, the engineers cannot tell us, for, though the settings have been working for ten years, the end of their life has not been reached. In England, silica ware, it must be confessed, has not until recently been altogether satisfactory; but the author has seen comparative tests which prove that silica material turned out by English manufacturers to-day is every whit as good as the American material.

Quenching.

The methods adopted for quenching in American gas-works have been largely influenced by coke-oven practice, which now has standardized itself along the following lines.

The coke is pushed directly into a car, which then travels to a point some few yards beyond the end of the battery. Here it runs into a brick structure in the form of a tower which contains large spray pipes. When the car is in position, the operator touches a switch, and a spray of water from an overhead tank floods the whole charge. A definite number of gallons is sprayed at a time, and the water shuts itself off automatically after this quantity has been used. The car then moves out, pauses for a few seconds to clear the car of water, and passes to the wharf, which is an inclined surface reaching in some instances 100 to 150 ft. in length. The lower edge of the incline is closed by gates, which can be raised to allow the coke to pass slowly on to a belt conveyor that ultimately delivers it to the screening station.

The author has seen this system adopted with great success on a 500-ton intermittent vertical plant. The method has several distinct advantages—

(1) Labour saving. The quenching is attended to by one man.
(2) The maximum quenching can be obtained with a minimum of water.
(3) Recovery of a great proportion of the water possible.
(4) Being quenched apart, there is no deterioration of structure of the battery.
(5) With coke-ovens a smaller wharf is required.
(6) It can deal with very large outputs of coke.

Other Plant.

The bladed exhauster, as we know it, is very little used; the Roots blower and the centrifugal turbine-driven type being favoured. The latter is preferred now, specially where direct recovery of ammonia as sulphate is practised, owing to its great help in tar removal. Gas washing and oxide purification are carried out much as usual over here. Oxide is used in layers of 4 or 5 ft. thick, and is mixed with a much greater proportion of shavings than is usual here.

Liquid Purification.

At a number of places a very interesting development has taken place. Prior to passing into the oxide boxes, the gas is washed in a tower with a dilute solution of sodium carbonate. This will remove 85 p.ct. of the H_2S in the gas. The sodium carbonate passes through another tower where a stream of air "actifies" it; and it is used time and time again. The effects of adding this process to an existing dry purification are: (1) Large increase in the purification capacity, at small cost. (2) Oxide purification costs very little, for a gas which contains only about 50 grains per 100 c.ft. is being dealt with. (3) Some of the HCN is also removed. (4) Avoidance of adding inerts to the gas, for revivification purposes. The difficulties as yet are not cleared away for the introduction of this process in England; but the author witnessed experiments which promised a direct recovery of the whole of the H_2S in the gas, the product being sulphur.

External Producers.

In most plants being installed now, the firing is arranged to be carried-out by producer gas from a separate plant. The type largely favoured for this purpose is the Kerpely producer with conical grate and mechanically-rotated ash pan. You will be familiar with this apparatus. Plants in America are working either on a screened small coke of about ⅜-in. size, or on an unscreened fuel from about 1½ in. down to dust, with complete success.

In one works visited, a 500-ton vertical plant was fired from four producers fed with 1½ in. to dust fuel. All the coke make of this size was disposed of in this way. Steam for the whole of the works was raised in waste-heat boilers. Stress was laid on the constancy of the heating conditions, and the engineer considered his freedom from repairs over seven years to be due largely to this reason. The adoption of external producers should, in England, lead to the abolition of those large stocks of breeze which for long have been the bugbear of the gas engineer.

Water Gas.

Some reference must be made to this widely used gas. Generally, the form of apparatus is similar to that installed here, but the units are larger. Sizes from 2 to 3 million c.ft. per day are common. The fuel used is generally coke screened over ¾ in. or 1 in. The plants are invariably fitted with waste-heat boilers, and the exhaust steam from the fans is used under the grates. Air blasts are as high as 40 in. The most noticeable innovation is the adoption of automatic operation, which is controlled by a "mechanical man." This is a device by which cams on a rotating shaft allow oil pressure to operate a series of valves. These in turn allow water pressure or exhaust to act on cylinders attached to the blast valves, reversing valve, stack valve, &c., and move them in accordance with the desired cycle. The only manual labour is the interruption of the cycle at charging times, and the opening and closing of the charging lid every half-hour. Thus two men, with practically no manual work, can make more than 10 million c.ft. of carburetted water gas per day.

One very interesting plant visited provided a rather unusual arrangement. The whole of the make of coke from a 160-ton intermittent vertical-retort installation was taken across to a large water-gas plant. The red-hot coke was dropped from the retorts into a car, which took it without quenching to a skip hoist, which in turn elevated it to an airtight bin at the water-gas plant, whence it was drawn as required. The coke was hot when charged into the generators.

Use of Coke-Oven Gas for Town's Purposes.

Generally speaking, the steel works, blast furnaces, and coke-ovens are situated together, and the surplus coke-oven gas is readily absorbed in the steel works. In not a few places, coke-oven gas is pumped into cities—such as Chicago, Baltimore, Newark, &c. The gas is generally of a quality exceeding 550 B.Th.U., and may be purified at the ovens or in the town.

At Chicago, only the surplus gas is thus used, and the variations due to the season are looked to by the town authorities, who shut-down or start-up their water-gas plant as required. At Newark, the ovens normally are fired by producer gas; the whole of the coke-oven gas being sold to the town. During the summer, when the demand is lower, some of the producers are shut-down and the ovens fired with coke-oven gas. Then only about two-thirds of the make is available for sale. Such arrangements work very well; and in England, without doubt, we shall see an extension of them.

Supervision, particularly in coke-ovens, is carried to a very high pitch, and the desire to have definite information on such matters as steam used, air flows, pressures, and temperatures, leads to the installation of a large number of recorders. Intelligent use of the information provided by these results in a high efficiency. This they are bound to have, as labour rates are high, and only by obtaining a large throughput per man can the effect of this be counteracted. Labour-saving devices which enable a man to handle a greater amount of work are installed wherever possible.

The author has returned with the feeling that each country can with advantage learn from the other. Most of the friends he met were eager to know what was being done on this side; and he would end up with a plea that a careful study of the methods in both countries will help towards progress in each.

Discussion.

The President congratulated Mr. Townend (who, it may be mentioned, was formerly engaged at the Nechells Works, Birmingham)

upon the comprehensive character of his address. It dealt most fully with many points of interest to those engaged in the industry.

Mr. E. ARTHUR inquired as to the material used for the belt conveyors.

Mr. TOWNEND replied that they were rubber covered, and of the highest quality. Generally they were without joint. In reply to Mr. J. H. Gee, he stated that the silica brick was used in almost all carboniz ng operations in America. The Thomas calorimeter was largely employed, so that the records were satisfactory. Owing to the severity of the weather, unusual methods had to be adopted to ensure the release of the frozen coal from the steel trucks. The bottom of the truck was heated by oil burners, and the coal bins were steam heated. The lutes of the holders were also kept warm by steam. A fast-burning coke was required in the States. Answering Mr. C. F. Tooby and Mr. A. R. Myhill, the author said that sulphuric acid was made almost entirely from native sulphur, and spent oxide had practically no value. As to the quicker rate of carbonization in America, he pointed out that with the Becker type of coke oven the elimination of the horizontal flue allowed of the heat being passed into the top layers of the charges more quickly than with the older forms of oven.

The PRESIDENT commented upon the great value of these visits to other countries, and particularly to the United States. They meant an exchange of ideas. It would appear that much could be learned from American practice; and he had no doubt American engineers could learn something from English methods.

On the motion of Mr. GEE, seconded by Mr. MYHILL, a vote of thanks was passed to Mr. Townend, who was cordially welcomed on his return visit to Birmingham.

In reply, Mr. TOWNEND observed that the Americans were sometimes chided about "talking big;" but it was, he thought, somewhat excusable, because operations in the gas and coke industry there were on a much bigger basis than in England. He had visited the largest coke-oven works in the world. In picturesque detail he described the working of the great batteries.

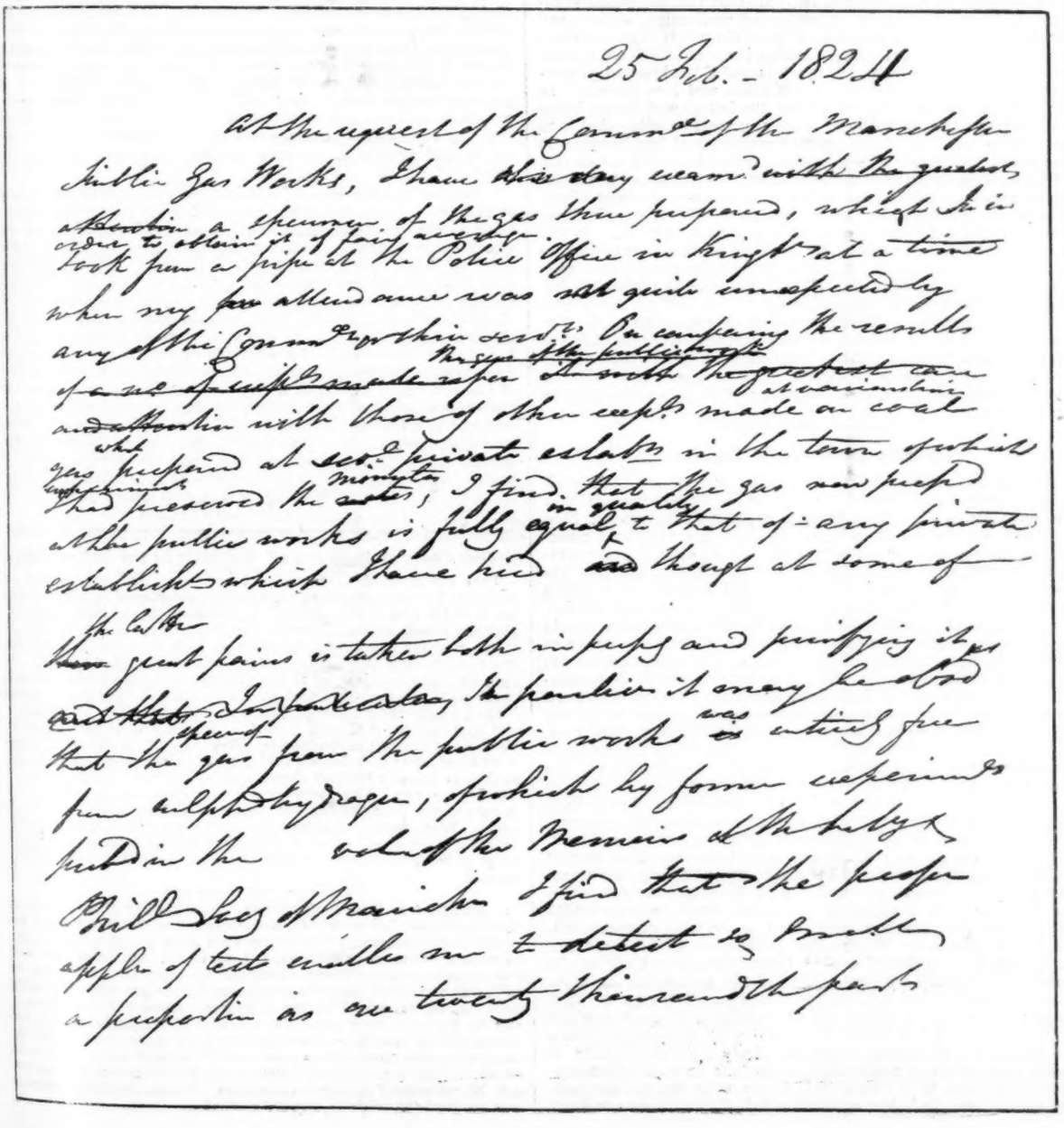
A LINK WITH THE PAST.

A Report on the Quality of Gas One Hundred Years Ago.

Below is given a photograph of Dr. Henry's original draft of a report (dated Feb. 24, 1824) submitted by him to the Commissioners of Police concerning the quality of gas "prepared" at the Manchester Public Gas-Works.

The wording of the report is as follows:

At the request of the Commissioners of the Manchester Public Gas-Works, I have examined a specimen of the gas there prepared, which I, in order to obtain it of fair average, took from a pipe at the Police Office in King Street at a time when my attendance was quite unexpected by any of the Commissioners or their servants. On comparing the results with those of other experiments made at various times on coal gas prepared at several private establishments in the town of which experiments I had preserved the minutes, I find that the gas now prepared at the public works is fully equal in quality to that of any private establishment which I have tried, though at some of the latter great pains is taken both in preparing and purifying it. In particular it may be observed that the specimen of gas from the public works was entirely free from sulphuretted hydrogen, of which by former experiments published in the volume of the "Memoirs" of the Literary and Philosophical Society of Manchester I find that the proper application of tests enables me to detect so small a proportion as one twenty-thousandth part.



RECENT CONTRACTS FOR GLOVER-WEST VERTICALS.

Within the last month, three important contracts for Glover-West vertical retorts have been placed.

At Vancouver (B.C.), the original plant of three settings of the old-type retort, with a capacity of 800,000 to 900,000 c.ft. per day, is to be extended by the addition of five further settings with a daily capacity of 2 million c.ft. With the new plant, the West lip-bucket conveyor is to be added to serve the whole installation, and a waste-heat boiler of the "Kirke" induced-draught type is to be installed.

The second contract is for an installation of a daily capacity of 4 million c.ft. for the Plymouth and Stonehouse Gas Light and Coke Company. This plant is to be erected on the site of an existing inclined retort bench, which is to be demolished. The contract includes the West lip-bucket conveyor handling coal and coke, coke hoppers and screens, coal breaker and elevator, and a waste-heat boiler plant, also of the "Kirke" patent type, manufactured by Messrs. Spencer-Bonecourt.

The third contract is for an installation to be erected at the Torquay Gas-Works, to make 1,800,000 c.ft. of gas per day. The installation will include, in addition to a waste-heat boiler of the "Kirke" type, a very complete set of coal and coke handling plant, and a coal-store plant to deal with the particular conditions of coal supply existing at these works.

Coal Analyses for Clinkering Temperatures.

Dealing in "Coal Age" with the determination of the fusibility of coal ash, Mr. R. L. Grimes points out that this is specially important in relation to the operation of mechanical stokers and production of gas. The composition of the ash is often far more important than the amount. Alumina is the most refractory constituent of ash, and its fusing-point (2000° C.) is lowered proportionately to the amounts of alkalis, silica, and iron present. In many coals the amounts of all but the last-named do not lower the fusing-point sufficiently to cause any great trouble—that is to say, below 1400° C. At this point the amount of iron becomes of supreme importance. The technical composition of the iron is also of great importance; for in the ferrous state it lowers the fusion-point greatly, while in the ferric state it has but slight effect. The writer remarks that the influence of sulphur upon fusing-point probably depends upon the iron pyrites content. In the presence of burning carbon, the ferric oxide may or may not be reduced to ferrous oxide, according to the amount of oxygen supplied and the care of the fire. This he suggests as explaining discrepancies between actual clinkering of the coal on the grates and the fusing-point as determined in a laboratory furnace. For the same reason, the fusing-point will be found to vary in different types of laboratory furnaces. Therefore he thinks it advisable to choose such furnaces for laboratory tests as will give reducing atmospheres, and hence lower the fusing-point, thus indicating the proper results.

Calorific Standards in America.

Among the subjects touched upon by Mr. Henry O. Loebell (Vice-President and General Manager of the Combustion Utilities Corporation), in an address to the Gas Sales Association of New England, was the high calorific standard at present imposed generally upon American gas undertakings. In his view, the entire relationship between the public service commission and the gas company should be on the basis that the function of a utility undertaking is to give adequate industrial and domestic service Furthermore, the purpose of a public service commission should simply be to see that at all times the utility undertaking operates with the highest possible efficiency, and supplies adequate service at the lowest possible cost. The gas company should be responsible for the technique of their own business, and should be allowed sufficient leeway to make at all times those changes which will allow them to supply the best service at the lowest possible cost. As an illustration of the need for such relationship, he instanced the enforcement of the present high calorific value standards. He pointed out that to-day most of the utility undertakings have to manufacture gas of 550 to 600 B.Th.U., and are therefore obliged to buy high-grade coal and other materials, whereas the customer, whether domestic or industrial, could obtain at least as good service with a 400 or 450 B.Th.U. gas, and at the same time the cost of manufacturing this would be less to the company, and therefore less to the consumer. In many of the States the companies are bringing their coal 500 or 600 miles, simply because a high calorific standard has been prescribed by the regulating commission, when they have, practically speaking at their back doors, large available supplies of coal. Heating value standards are, he declared, absolutely unnecessary, "and the sooner our gas companies are freed from this serious limitation the sooner we shall be able to reduce the cost of our commodity to the customer and begin to expand our industrial business." By progress along lines of elimination of heating value standards and the adoption of newer manufacturing methods, "we can look forward with assurance to the time, in the not distant future, when the gas company can put gas into the holder at just one half of what it costs to-day."

The "Pyro" Radiation Pyrometer.

There is an illustrated description in the issue of "Engineering" for the 18th inst. of the "Pyro" pyrometer—a new instrument of the radiation type which has recently been put on the market by the Bowen Instrument Company, of No. 9, Newton Road, Leeds. It is easily portable, weighing only 25 oz., and measuring 7 in. long by $4\frac{3}{8}$ in. in diameter; and it is completely self-contained, requiring no batteries or other accessory apparatus. The cylindrical aluminium body has an axial extension of smaller diameter at each end. In one extension is mounted a lens or object glass, while the other carries an eyepiece. The lens is to focus an image of the hot body on to a blackened absorbing disc. To this disc the hot junction of a small thermocouple is soldered, and the whole is enclosed in an evacuated glass bulb. The two leads from the thermocouple are connected to a sensitive millivoltmeter of the moving-coil type, which is mounted in the body of the instrument; and the deflection of the needle of the millivoltmeter, by the electromotive force set up in the thermocouple when the image of the hot body falls upon it, is a measure of the temperature of the latter—the scale being graduated to read the temperature directly. The portable form of the instrument described is supplied in a wooden carrying case, and can be used without removal from it.

The Cancer-Producing Factor in Tar.—The "Pharmaceutical Journal" says that, in a report on this subject by Dr. E. L. Kennaway, of the Cancer Hospital Research Institute, London, published in the "British Medical Journal" of March 29, the author states that the results obtained by him confirm the industrial evidence that the cancer-producing substance is present in the higher-boiling fractions of lignite tar, gas-works tar, producer-gas tar, and coke-oven tar. Wholly negative results have been given by the attempts to find the cancer-producing substance among the known constituents of coal tar. Anthracene, phenanthrene, chrysene, picene, retene, acenaphthene, fluorine, acridine, carbazole, aniline, benzene, toluene, and xylene, have been excluded by the experimental tests; and either the experimental or the industrial evidence, or both, is against the importance of naphthalene, the acids, bases, and other nitrogenous compounds, paraffins, olefines, and naphthenes. It now seems not unlikely that this substance is a compound as yet unknown, which is unstable and present in amounts perhaps as small as vitamins in foods.

Flueless Gas-Stoves.—A Joint Committee formed by the Society of Medical Officers of Health and the Royal Sanitary Institute to consider the use of gas-stoves for domestic and workshop heating where no provision is made for the escape of flue gases to the outer air, have issued their report. This states that correspondence has taken place between the Committee and the Chief Inspector of Factories, Home Office; and, owing to the kindness of Medical Officers of Health, much valuable information on the use of flueless gas-stoves has been received from large cities. Dr. J. S. Owens has submitted a valuable report on "Flueless Gas-Fires from a Hygienic Aspect." So convinced are the Committee of the absolute necessity of a very free ventilation existing where flueless gas-stoves are in use that—bearing in mind the usual absence of this free and effective ventilation in living rooms, bedrooms, workrooms, &c.—they think it desirable to discourage the introduction of these stoves, and to express the opinion that their use can only be justified in such places as entrance halls, passages, landings, &c., where ventilation is free, and where occupants do not remain for any considerable length of time.

Higher Costs of Labour and Materials in the United States.

That the upward tendency of labour costs and the charges for materials has of recent years been no less pronounced in America than has been the case in this country, is evident from the latest statistical abstract issued by the United States Department of Commerce. It seems that for the year 1914 the wages paid in connection with the manufacture and distribution of gas amounted to $26,800,000. By 1919 the figure had jumped to $52,700,000, or approximately twice as much as it was five years earlier. In 1921 it was $53,300,000, representing a two-year increase of $630,000, and an increase between 1914 and 1921 (a seven-year period) of $26,500,000. Since 1921 wages for all classes of labour in the industry have been on the climb, and there is no expectation of a decline during 1924. The cost of material used in the gas industry has also shown a great increase. In 1914 the figure was $77,000,000. Five years later it had risen to $157,000,000, and in 1921 it was $202,000,000—an increase of $125,000,000 in seven years. Were figures available for 1923, says the "American Gas Journal," they would show an increase of several million dollars over 1919, for the price trend, with but few exceptions, has been steadily upward.

Reduction in Price at Congleton.—At a meeting of the Congleton Gas Committee last week, Mr. Lawton proposed that the price of gas to slot-meter consumers be reduced from 4s. to 3s. 9d. per 1000 c.ft., to ordinary consumers from 3s. 11d. to 3s. 6d., and by 6d. per 1000 c.ft. to persons using it for manufacturing purposes. Everyone, he said, was entitled to some consideration, for the gas undertaking was built up and supported by the ratepayers' money. Mr. Williamson said he regarded the gas-works as a branch of the public service, and he was glad to hear Mr. Lawton say that it was a concern in which the ratepayers were shareholders, and that all should have equal consideration. He moved an amendment that a reduction of 5d. per 1000 c.ft. be made to all classes of consumers. Eventually the amendment was lost, and the original proposal carried.

CORRESPONDENCE.

[We are not responsible for opinions expressed by Correspondents.]

White Lead Paint and Gasholder Corrosion.

Sir,—With reference to your leader *re* corrosion of gasholders, and to the observation of Mr. Vass, no doubt others have likewise found the white-lead sheet numbers on the inside of holders in excellent preservation after decades of use. I write to add an experience of my own of some fifteen to twenty years ago, which tends to confirm the opinion that white lead is a first-class preservative first-coat paint for the outside of holder sheets.

The paint on the crown sheets of a 100 ft. diameter mild-steel holder had cracked and peeled badly. It was completely stripped off. The holder had been painted with red oxide, but the crown sheets had been numbered on the outside with white-lead paint. It would have been impossible to place a finger tip on any spot on the crown sheets which had not rusted, even where the oxide paint had adhered, except where the white-lead numbers had been painted. This white lead was exceedingly difficult to remove with scrapers; but when this was done the sheets under the white-lead paint were found to be free from the slightest trace of rust.

Since that time I have painted such holder side sheets as have had to be stripped down to the metal with one or two thin coats of white lead paint (first removing every trace of rust by scraping and brushing with fine pin wire brushes and paraffin oil), and then covered them with a coat of red oxide, and have found that, so long as the white-lead has been prevented from coming into direct contact with the tank water and air, by keeping the red oxide covering in good condition, the sheets are preserved from corrosion.

It was absolutely necessary to remove every trace of rust by brushing with paraffin oil before applying the white-lead paint; otherwise, even when no rust could be discovered by the naked eye, corrosion of the sheets continued, and soon ate through both white lead and red oxide.

Bridlington Gas Company, April 17, 1924. J. Kelly.

REGISTER OF PATENTS.

Surface Combustion.—No. 190,164.

Surface Combustion Company, Inc., of New York (Assignees of A. W. Peters, of Tarentam, Penn.).

No. 33,469; Dec. 7, 1921.

Convention date, Dec. 7, 1921.

This invention relates to a method and apparatus for producing and supplying a mixture of gases in desired proportions, and more especially to a method and apparatus for producing and supplying an explosive mixture of fuel gas and air, preferably to the burner discharge orifice of a surface combustion furnace; the invention allowing of fulfilling the conditions of constant proportions, variable quantity, and exit pressure sufficient to prevent back-flashing.

The main features of the invention will be understood from the first two claims, which are:

1. A method of producing and supplying a proportioned mixture of two gases, one of which acts as an inducing gas, the other, or induced gas, being supplied at a pressure equal to that against which the mixture is discharged; characterized by the inducing air being supplied under a relatively high pressure to the entrance cone of a Venturi tube, and the induced gas, under pressure equal to that against which the mixture is discharged, being supplied through an adjustable passage adapted to regulate the proportion of the induced gas in the mixture delivered and to convey said induced gas to the edge of the stream of the inducing gas through an opening or openings of excess size, slightly beyond the point of minimum cross-section of the Venturi tube.

2. An apparatus for carrying into practice the method claimed above comprising a Venturi tube, means for supplying the inducing gas under a relatively high pressure to the entrance cone of the Venturi tube, an annular chamber surrounding the middle portion of the Venturi tube and communicating therewith by means of transverse holes slightly beyond its point of minimum cross-section, and means for supplying the induced gas to said chamber comprising a pressure governor intended to maintain the pressure of the induced gas equal to that against which the mixture is discharged and an adjustable passage for regulating the proportion of the induced gas in the mixture delivered from the Venturi tube.

Gas-Meters.—No. 212,764.

Hart, J. T., of Fulham, S.W. 6, G. Glover & Co., Ltd., of Ranelagh Works, S.W. 3, and Radiation, Ltd., of Grosvenor Place, S.W. 1.

No. 9761; April 10, 1923.

This invention relates to gas-meters which can be conveniently employed for measuring the individual consumption of a single heating or cooking stove, or a small group of lighting burners, so that the supply of gas to one or more rooms in a building can be measured separately from the general supply to the whole building. The invention is applicable to meters provided with a coin-freed device as well as to those without stop valves.

The patentees claim: A gas-meter of the type in which the diaphragm chamber is divided into two compartments, each compartment having arranged therein an annular diaphragm attached to the wall of the chamber by a ring and to a central rigid plate, wherein the rigid plates are respectively mounted on sleeves, slidable towards or away from a central partition on a rod extending from each side at right angles. The sleeves are provided with eye blocks through which pass rods extending from rocking spindles by which movement is communicated to the valves. The end of each rod is curved, and a collar provided on the rod to limit its movement through the hole in the eye block. The crank shaft (rotated by the rocking spindles) is provided with separate cranks respectively connected to corresponding valves.

Wet Gas-Meters and Other Apparatus.—No. 211,930.

Crowther, G., and The Liverpool Gas Company, both of Liverpool.

No. 32,259; Nov. 25, 1922.

This invention, relating to float-controlled valve mechanism, is especially applicable to wet gas-meters, though it can be applied to measuring liquids by the use of a tank having a high and low water line, for shutting off the gas supply to a calorimeter or other gas apparatus when the water supply fails, or for providing a given quantity of hot water at a certain temperature from a hot-water cylinder connected with a gas-boiler.

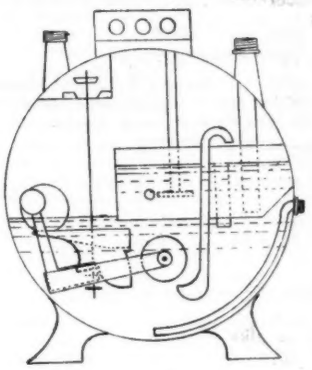


Fig. 1.

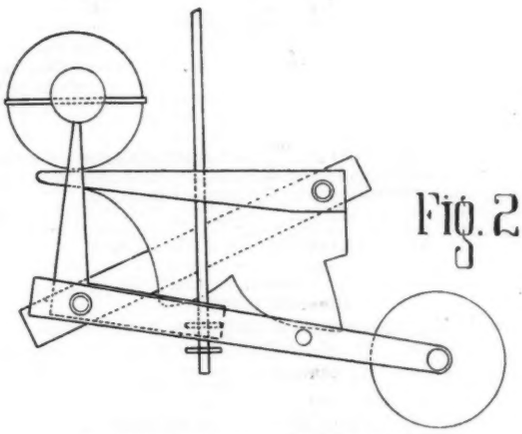


Fig. 2.

Crowther's Float-Controlled Valve Mechanism.

Use is made of a system of co-acting floats to obtain quick opening or closing of the gas valve. Fig. 1 shows a wet meter incorporating the arrangement, which is given to a larger scale in fig. 2.

It will be seen that there is an upper and a lower float. The lower float is carried by an arm pivoted at one end. This arm carries a roller between the pivot and the float, and the roller bears against a lower cam surface of a triangular member pivoted at its upper corner. The upper face of the triangular member is adapted to engage the underside of the upper float. The vertical side of the triangular member is made as a cam adapted to engage with and lock the roller of the arm of the lower float. A secondary arm is provided having an upwardly projecting stem with a counterweight at the top, so that when this stem is moved to right or left of a neutral (vertical) position the counterweight will throw it sharply over. This stem is adapted to operate the valve wire when the secondary arm is actuated by the floats.

In operation, water is poured into the meter at the filling cup to fill a chamber provided with an overflow pipe into the reserve chamber. As the water rises in the reserve chamber, the lower float endeavours to lift the main arm, but is unable to do so as the roller bearing engages the cam on the arm. This resistance is maintained until the water in the chamber has reached the upper level. The upper float follows the rising water, and in so doing draws the triangular arm in an upward direction. This also draws the cam along the roller bearing to a position which releases the arm. This action allows the lower float to rise suddenly, and in so doing lifts the valve wire by means of discs and (in this example) the secondary arm which also acts from the fulcrum of the main arm. When the secondary arm is raised, its balance weight passes the point of equilibrium and takes the weight of the valve and its wire.

The valve is thus suddenly opened at the moment the water in the chamber reaches the maximum height. The surplus water is drained from the meter by the overflow pipe.

When the water line in the chamber commences to fall from its

maximum height, the upper float endeavours to follow it, but is unable to do so as the cam on the triangular arm is engaged by the roller bearing and maintains it in the position it occupied when the water was at the upper level. This position is maintained until the lower float, following the falling water level, releases the cam. In falling, the triangular arm causes a cam to engage the secondary arm and draw the balance weight over the point of equilibrium. This allows the valve to close; and the upper float rests on the valve wire. To reopen the valve the maximum water line must be restored.

A modified arrangement is described and illustrated; and it is pointed out how the invention is applicable to the other purposes mentioned above.

Gas-Fire Radiants.—No. 212,343.

Nichols, F. G., of Charlton, S.E. 7.

No. 35,175; Sept. 24, 1923.

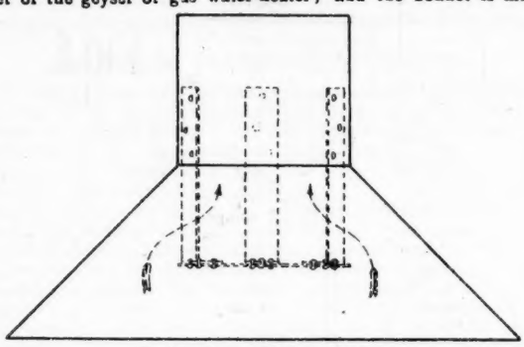
This invention relates to radiants of the pillar type; the patentee claiming the provision of thin transverse and diagonal bars across the bore, so placed that on becoming incandescent they shine through the openings in the reticulated front of the radiants.

Down-Draught Preventer.—No. 212,408.

Davis, B., of Bristol.

No. 6511; March 7, 1923.

This device for prevention of down draught is made of heat-resisting metal. The diameter of the flue pipe is slightly larger than the fume outlet of the geyser or gas water-heater; and the bonnet is made



Davis's Down-Draught Baffle.

according to the size of the latter. The draught preventer is positioned about three inches above the fume outlet, and is fixed with metal straps, leaving sufficient space for the fumes to pass out.

APPLICATIONS FOR PATENTS.

[Extracted from the "Official Journal" for April 9.]

Nos. 8064 to 8661.

Clark, F. W.—"Manufacture of gas from coal, &c." No. 8653.
Coxeter & Sons, Ltd.—"Automatic gas-bag pressure regulator." No. 8466.
Dempster & Sons, R., Ltd.—"Retort settings." No. 8405.
Fox, T.—"Prepayment mechanisms." No. 8393.
Heywood, C. F.—"Valve device for high-pressure fluids." No. 8139.
Menjaud, G.—"Lighter and extinguisher for gas-burners." No. 8543.
Regenerative Coal Gasification System, Ltd.—See Clark, F. W. No. 8653.
Robinson, S.—See Fox, T. No. 8393.
Sandy, W. J. L.—"Gas-ovens, radiators, &c." No. 8422.
Toogood, H. J.—See Dempster & Sons, R., Ltd. No. 8405.
Travers, M. W.—See Clark, F. W. No. 8653.
Wellesley, G.—See Coxeter & Sons, Ltd. No. 8466.

[Extracted from the "Official List" for April 16.]

Nos. 8662 to 9351.

Compagnie pour la Fabrication des Compteurs et Matériel d'Usines à Gaz.—"Gas-meters." No. 8929.
Durand, E.—"Gas, &c., valves." No. 9122.
Fowler, C. R.—"Gas-nipples for burners." No. 8719.
George, Ltd., W. & J.—"Geysers." No. 9092.
Hansford, J.—"Prepayment gas-meters, &c." No. 9331.
Hedley, T. J.—See George, Ltd., W. & J. No. 9092.
Helps, G.—"Gas manufacture." No. 9217.
Hudson, G. C. & J. J. C.—"Geysers." No. 9285.
Koppers Company.—"Standpipes for discharge of distillation products from retorts." No. 9006.
Lucas, J.—"Combined gas-main blocking and by-pass, &c., apparatus." No. 8998.
Potts, H. E.—"Decomposing coal tar, &c., into phenols and neutral oils." No. 8950.
Schucany, W.—"Regenerative furnaces." No. 8877.
Smith Meters, Ltd.—"Valves." No. 9171.
Stinnes, Z. M.—See Potts, H. E. No. 8950.
Turner, E., and Turner & Co., E.—"Compressors for pre-mixed gas and air, &c." No. 9109.
Umpleby F.—"Gas-generators." No. 8693.
Weindel, A.—See Potts, H. E. No. 8950.
Wilkinson, A. E.—"Gas-burners." No. 8835.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Select Committees have been appointed to consider the Manchester Corporation Bill and the Rhymney and Aber Gas Bill. They will meet on May 7 and 13 respectively.

Gas Regulation Act.

Copies were presented of drafts of Special Orders proposed to be made by the Board of Trade under section 10 of the Act on the application of the Newbury Corporation, Dunstall Urban District Council, Penryn Gas Company, Ltd., and the Mansfield Corporation.

Public Utility Companies (Capital Issues) Act, 1920.

A copy was presented of a report on an application by the Littlehampton Gas Company to the Board of Trade under this Act.

HOUSE OF COMMONS.

Fuel Research Board.

Sir H. Brittain asked the President of the Board of Education how long the Fuel Research Board had been in existence, the sum of money it had cost, the number of staff employed, and the emolument of each.

Mr. Trevelyan stated that the Fuel Research Board was established in February, 1917. The expenditure by the Department of Scientific and Industrial Research on the work of the Fuel Research Board up to March 31, 1924, amounted to £195,480. The premises of the Fuel Research Station at East Greenwich were provided and maintained by His Majesty's Office of Works. The expenditure by that Department on the station up to March 31, 1923, amounted to £203,352. The numbers and emoluments of the staff employed under the Board were given in the Estimates for the Civil Service for the current financial year.

Gas Charges (Sub-Tenants).

Mr. Marley asked the President of the Board of Trade whether, seeing that the sub-tenant of a householder who uses gas under a check-meter system has no legal safeguard to prevent the householder charging him a rate higher than that demanded by the gas company, he would introduce legislation to protect the sub-tenant in this respect.

Mr. Webb replied that he would consider the suggestion. As at present advised, however, he doubted if legislation would be practicable.

LEGAL INTELLIGENCE.

BRITISH SULPHATE OF AMMONIA FEDERATION, LTD., v. SOUTH METROPOLITAN GAS COMPANY.

A Settlement Arrived At.

In the King's Bench Division of the High Court of Justice last Wednesday, before Mr. Justice Greer, the case of the *British Sulphate of Ammonia Federation, Ltd., v. South Metropolitan Gas Company* was stated to have been settled.

Mr. C. T. Lequesne, on behalf of the plaintiffs, said the parties had now come to terms, which he and his friend Mr. Wylie (for defendants) had endorsed on their briefs. On these terms, the matter had been settled.

His Lordship: I do not think anybody will be sorry. It was obviously a case more satisfactorily disposed of by compromise than by a decision.

Mr. Wylie: We dealt with it by accountants going thoroughly into the accounts, with the result that this arrangement was arrived at.

Fatal Accident at a Midland Tar Works.—A distressing accident involving the death of two men occurred last week at the Midland Tar Distillery Works, Oldbury. Mr. F. P. Evers (Coroner), who opened the inquest on Friday, stated that the men met their deaths by being overcome by fumes while at work. Dr. Mence said he was called to the works, and arrived just before the men were got out of the still. There were no signs of life in either. He and the relief party of the works tried artificial respiration for over an hour without result. There was plenty of oxygen available, and many men to assist. They did their work well. Mr. C. B. Robinson (a Director of the Midland Tar Distillery), on behalf of the Company, expressed sympathy with the relatives. The inquiry was adjourned.

Co-Partnership at Tunbridge Wells.—The Chairman (Mr. Harold A. Beeching) presided over the annual general meeting of co-partners in the Tunbridge Wells Gas Company, at which about 150 were present. He said the scheme was now firmly established, and he hoped and believed the whole of the employees had adopted the watchword "efficiency," which had been suggested by Mr. L. G. Langford (the Engineer) at the previous meeting. The revival of co-partnership had done a lot to promote the combined interest of consumers, stockholders, and employees. The total stock acquired by the Trustees since the inauguration of the scheme in 1908 was £2600. At the conclusion of the business meeting, all present sat down to an excellent supper, as the guests of the Directors.

MISCELLANEOUS NEWS.

GAS REGULATION ACT APPLICATIONS.

There have appeared in the "London Gazette" the following further notices regarding applications to the Board of Trade under the Gas Regulation Act.

SPECIAL ORDER.

Castleford and Whitwood Gas Light and Coke Company.

Notice is given by the Company of their intention to apply to the Board of Trade for a Special Order to extend the limits of supply, to authorize them to use scheduled lands for gas-works purposes, to raise additional capital, and to make further provisions with regard to the supply of gas and the management of the Company's affairs.

DECLARATIONS OF CALORIFIC VALUE.

Hertford Gas Light Company.—500 B.Th.U. (July 1.)
New Mills Urban District Council.—480 B.Th.U. (July 1.)

METROPOLITAN GAS COMPANIES' OFFICIAL TESTINGS.

The reports of the Gas Referees of the official testings for the past quarter under the provisions of the Gas Regulation Act give the following average calorific values for the gas supplied by the Metropolitan Companies named.

Brentford Gas Company.—505·2 B.Th.U. (declared calorific value, 500 B.Th.U.). Sulphuretted hydrogen was present on one occasion in the gas supplied from the Brentford station of the Company.

Commercial Gas Company.—480·3 B.Th.U. (declared calorific value, 475 B.Th.U.).

Gas Light and Coke Company.—500·7 B.Th.U. (declared calorific value, 500 B.Th.U.). Sulphuretted hydrogen was found on one day at the testing place at Lansdowne Road. The Chief Gas Examiner has decided in regard to this case that "the default of the undertakers was not substantial, and was not due to the careless conduct of the undertakers or their servants, and I determine that no forfeiture be incurred by the undertakers in respect of such default."

South Metropolitan Gas Company.—565 B.Th.U. (declared calorific value, 560 B.Th.U.).

South Suburban Gas Company.—485 B.Th.U. (declared calorific value, 480 B.Th.U.).

Wandsworth, Wimbledon, and Epsom District Gas Company.—474·6 B.Th.U. (declared calorific value, 470 B.Th.U.).

POULTON-LE-FYLDE SPECIAL ORDER.

Mr. H. C. Honey (Director of Gas Administration) recently held an inquiry in London into an application by the Poulton-le-Fylde Urban District Council for a Special Order under the Gas Regulation Act, to authorize the acquisition of additional land, the extension of the limits of supply, and the charging of differential prices to consumers outside the existing area.

The erection of a proposed gasholder was objected to by Messrs. Brown & Co., nurserymen, on the ground that it would interfere with their rights of light. They also urged that fumes from the gas-works would damage their adjoining seed-testing land. On behalf of the Council, Mr. E. J. Sutcliffe argued that Messrs. Brown & Co. had no rights of light over the land. He pointed out that the Board of Trade were not being asked to give the undertaking statutory authority to put their holder in any particular position, but to say that they could use the land in question for gas-works purposes. If any damage resulted to the objectors, they had a remedy at law. As to the other point, Messrs. Brown & Co. must have known they were up against gas-works, and that this land would soon have to be used for extensions. Mr. J. H. Booth (the Gas Manager) gave evidence.

The draft Order contained the clause to which railway companies have objected, dealing with obligation to supply gas for other than lighting or domestic purposes in the case of mains of insufficient capacity; but after some discussion it was announced, in view of the need of obtaining the Order quickly, that the promoters would not press this clause.

Low-Temperature Carbonization.—Important gas developments are foreshadowed at Doncaster. It is announced that Low-Temperature Carbonization, Ltd., intend to instal 500 retorts at Doncaster, and that the Company are now in negotiation for the purchase of a piece of land on which to erect their works. They have, it is stated, also asked the Doncaster Corporation to take the surplus gas; but so far the Corporation have come to no decision in the matter.

The Engineering Industry and the Safeguarding of Industries Act.—The Council of the British Engineers' Association view with grave concern the decision of the Government not to introduce legislation to extend the duration of the provisions of Part II. of the Safeguarding of Industries Act, which deal with the making of Orders on the ground of depreciation of foreign currency. Their concern is not limited to the decision itself, but extends to its implications, as indicating the attitude of the Government towards the manufacturing industries of the country in their present struggle with adversity at a time when the most urgent need is to provide increased wealth-productive employment for our people.

THE NORTH-EAST COAST COAL TRADE.

From our Own Correspondent.

In the few days on which business was transacted in the week before Easter, there was not much doing in the market. The Newcastle market always makes the most of holiday seasons, and on this occasion there was every opportunity of doing so, as colliery terms were fully booked up in advance, and tonnage was in good supply.

At the beginning of the week, however, there was a distinctly easier feeling, which, it had been anticipated, would be the case if the probability of a strike receded. Quotations for specials and best gas remained nominally at about 25s., owing to most collieries being sold out for this month and a good part of May. It remains to be seen how matters will shape after the holiday; but prospects of forward business being strong are not considered bright.

YORKSHIRE AND LANCASHIRE COAL TRADE.

From our Local Correspondent.

Gas coals were in brisk demand in Yorkshire and Lancashire last week, to cover the holidays; and it remains to be seen what advance in price will be made for forward contracts. Collieries generally are asking for 2s. to 2s. 6d. increases. The milder weather has led to a decrease in the demand for house coal; and though collieries report full order books, there is a slacking-off in respect of forward deliveries.

With the growing improbability of a strike, industries are not displaying so much eagerness for supplies as they were two or three weeks ago. There is not much demand for coal for export; but to judge from appearances there will be an increase in this direction during the next few months, when the English market has a surplus of the fuel used during the past six months for inland purposes.

COAL TRADE IN THE MIDLANDS.

From our Local Correspondent.

Though there is no real subsidence of prices, and stringency is still the main characteristic of the market, competitors for supplies are no longer outbidding one another. So far as gas coal is concerned, collieries generally have nothing to offer before May. Meanwhile, deliveries are being made more regularly, and with the reduction in gas production brought about by "Summer time" and the smaller load for domestic heating, engineers are making the best of the position. It is expected that the exceptional market pressure will have exhausted itself by the end of this month, and buyers look forward to reinforcing stocks at easier prices.

Taking the fuel trade in all its branches, the tension is relieved; but the outlook causes forebodings. Users of steam coals are still working on a very narrow margin of stock. Gas coke has been advanced 2s. 6d. at Birmingham. The dearth is not so great as it has been, however. Furnace owners are looking forward to cheaper coke as the big drain on supplies for central heating and other domestic purposes diminishes. Supplies are still short, and an appreciable premium has to be paid in the case of business outside contracts concluded at 24s. at ovens.

Haywards Heath District Gas Company.

The annual meeting of the Company was held on April 11. Mr. Edward C. Charleton (Chairman), who presided, said that the capital of the Company remained in the same position as at the end of the previous year. The revenue account was of interest, the cost of coal being about £500 less than in 1922, though a larger quantity had been carbonized during the year. The position of the Company had been strengthened by a further addition of £1000 to the contingency account; and the balance to be carried to profit and loss account—viz., £4721—was an increase of nearly £800 over the corresponding figure at the end of 1922. The result of the year's working enabled them to pay a final dividend at the rate of £6 11s. 3d. p.ct. for the half-year to the end of December, making a final dividend for the year of £6 5s. 7½d., leaving a balance of £3503 to be carried forward to the next account. The contingency account now stood at the satisfactory figure of £3700, part of which was represented by the investment of £3350 in Conversion Loan, appearing on the asset side of the general balance-sheet. The price of gas had been reduced during the year by 2d. per therm, or 8½d. per 1000 c.ft. A further reduction of 1d. per therm had been made as from the readings at the end of last month. The quantity of gas sold during the year was over 69 million c.ft.—an increase of nearly 3 million c.ft., or 4·3 p.ct., over 1922. The excellent results were due to a large extent to their Engineer and Secretary, Mr. Whitcher.

At a recent meeting of the Rotherham Corporation Gas Committee the Chairman and the Engineer were authorized to negotiate for the purchase of an additional 500 automatic clocks to be affixed to certain lamps.

The Poulton Ratepayers' Association have received an official intimation from the Board of Trade that their opposition to the proposed increase of the maximum charge for gas has had success. In place of the Council's figure of 1s. 2d., a maximum of 1s. 1d. per therm, equivalent to a maximum of 5s. 2½d. per 1000 c.ft., has been authorized.

The Clowne (Derbyshire) Parish Council have decided to make an experiment with ten gas and ten electric lamps, to see which system is the cheaper for street-lighting purposes; and considerable interest is being aroused in the test. The Council have resolved to levy a precept for £200, to meet the expenses of lighting the parish with gas for the ensuing year.

BALTIMORE YEAR BOOK.

The Consolidated Gas, Electric Light, and Power Company of Baltimore being desirous that their stockholders and customers should know as much as possible about the undertaking's properties, growth, progress, policy, and achievements, issued a detailed year book for 1922, and this proved so successful that a second publication of the same nature has been prepared for 1923, under the editorship of Mr. Arthur W. Hawks, jun., and bearing the appropriate title "A House in Order."

From this it appears that in 1922 the Company had 159,720 gas consumers, and sold 9,307,518,000 c.ft. of gas, while in 1923 the 165,060 consumers took 10,015,893,500 c.ft. Since the present management assumed control in 1910, no less than $50,000,000 has been required for extensions and improvement of the properties. Of the gross income last year, the Company expended 5·88 p.ct. on maintenance. In the gas distribution system there are 927 miles of mains, 963 miles of house services, and 176,321 meters. The unaccounted-for gas is only about 3 p ct. The rates for gas in Baltimore average lower than those of any large city in the country; and while there has been a notable increase in the aggregate sales, due to the popularization of the service and to the growth of the community, there has also been a substantial intensification of the use per customer.

These increased sales per customer have resulted in the Company occupying a leading place in connection with both the gas and electric services in respect to the diversity of applications by all classes of consumers; and the Company have, in fact, been pioneers in introducing many of these. When for all excess consumption over a stated amount the customer pays at a substantially reduced rate, self interest impels him to use more, and to take advantage of the opportunity to employ the service for various conveniences, appliances, and comforts that he might ordinarily consider luxuries or extravagances, to be indulged in but seldom. Perhaps the most notable feature of the Company's secondary rates is the resulting large use of gas for miscellaneous purposes about the home, in the shop, and place of business. The average consumption of gas per domestic customer has, as a result of the secondary rates, increased from a total of about 30,000 c.ft. per year to 51,000 c.ft. per year. The success of these lower rates for increased use is due to the fact that, as the customer finds it economical to employ that portion of the system necessary to serve him for a longer time, the Company's existing investment is utilized to a greater extent. The cost of service is consequently automatically reduced, and the charge is lowered accordingly. From the investment side of this mutual system of rates, the Company find that, while they have constantly added new customers requiring the usual extensions of distribution system, they have increased the number of customers supplied per mile and the sales per customer, and consequently the sales per dollar invested. The importance of this increase in sales per dollar of investment is manifest. In 1910 the investment in property per dollar of gross income was $9·31; in 1923 this ratio had dropped to $3·83.

More gas was used for industrial purposes in Baltimore during 1923 than in any other year. Utilization of gas as a fuel has found its place in practically every industrial and commercial activity in the territory served by the Company. Wide diversity, as well as the sustained use from month to month by industrial fuel customers, has resulted in greatly reducing violent fluctuations in output. The use of gas in hotels, restaurants, hospitals, and institutions does not vary greatly from one month to another.

During 1923 the Company erected and put into operation the first plant at Riverside—a site recently purchased for a new gas manufacturing station. The plant referred to is for liquid purification of the coke-oven gas which the Company obtain from the ovens of the Bethlehem Steel Company at Sparrows Point. The Company also completed the installation in the new generator house at the Spring Gardens Works of two 12-ft. diameter water-gas sets, with accessory equipment. These two sets increased the daily manufacturing capacity of the Spring Gardens plant to 60 million c.ft. It is intended this year to extend the generator house, and to provide for two additional sets, which will bring the daily manufacturing capacity to 67 million c.ft. At present all gas manufactured by the Company is sent out from the Spring Gardens Works, which is one of the largest single gas plants in America.

Gas Lighting Improvement Company.—After an existence of nearly forty years under their original title, the Gas Lighting Improvement Company have decided upon a change of name to Glico Petroleum, L'd. This course has been adopted in consequence of the fact that the present activities of the undertaking bear no resemblance to the business which the Company in the first place carried on.

Publicity in Industrial Accounts.—In a paper which he read before the Royal Statistical Society, on Tuesday of last week, Sir Arthur Lowes Dickinson, M.A., F.C.A., compared English with American methods in the matter of "Publicity in Industrial Accounts." He suggested that modern industry is in effect a partnership between the capitalist, the management, and labour, and that the margin between selling price and cost of production should be divided between these partners in proportion to the contribution of each thereto. The carrying-out of this principle demands that sufficient detailed information of the cost of the product or service, and the profit resulting therefrom, should be forthcoming. The consumer also is interested in the financial results of the business, so that he may have some reasonable assurance that he is not being exploited by capital, management, or labour. Reference was made, among others, to the accounts of gas and electric undertakings in Great Britain published by the companies annually, and the absence of such accounts in the United States, where the public had to rely upon the returns made in specified form to the State authorities. The general conclusion drawn was that it is only in the case of public service—transport, gas, electricity, &c.—industries that really complete and detailed accounts are available to the public.

GAS REGULATION ACT, 1920.

BOYS' CALORIMETER

CALORIMETERS

PRESCRIBED BY

The Gas Referees

ARE

MANUFACTURED

:: PRINCIPALLY ::

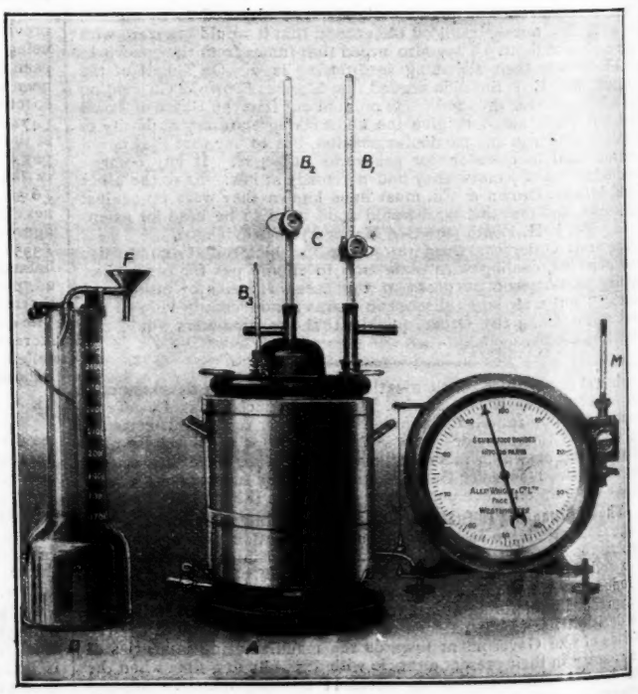
BY

ALEXANDER WRIGHT

& CO., LTD.,

1, WESTMINSTER PALACE GARDENS,

WESTMINSTER, S.W. 1.



WELLINGTON (N.Z.) GAS COMPANY, LTD.

A Vastly Improved Position.

The Annual Meeting of the Company, which was held at Wellington on Feb. 12, was presided over by the Chairman, Sir Harold Beauchamp, who, on behalf of the Board, congratulated the shareholders upon the vastly improved financial position of the Company as disclosed by the balance-sheet.

Sales of gas, at 477½ million c.ft., showed, he said, an increase of 4 p.ct. over 1922; but the revenue from this source had been somewhat less, owing to the reductions made in the selling price. The unaccounted-for gas had fallen by 1 p.ct. The results obtained from the Glover-West vertical retort plant were highly satisfactory, and its installation had been amply justified by the increase in the output of gas per ton of coal carbonized, and by its higher calorific value. The increase in the production of gas per ton amounted to approximately 3000 c.ft. While the Company obtained an increased output of gas per ton of coal under the Glover-West system, they were not, unfortunately, able to obtain quite so satisfactory a return from residuals as under the old system. A contract had been placed for an extension consisting of sixteen retorts of the latest design, arranged in units of four, together with a shell for adding an additional sixteen retorts. The erection of these would involve a large capital expenditure.

The increase in the sale of gas, together with reductions in taxation and cost of coal, and economies effected in administration, &c., had enabled the Company to afford considerable relief to consumers. A reduction of 4d. per 1000 ft. was made in January, and another reduction of 3d. in September. These concessions benefited consumers to the extent of £10,000 per annum. The Board had decided to make another cut of 3d. per 1000 c.ft., to take effect from March 1. This would mean a further saving to consumers of not less than £6000 a year. To Mr. M. J. Kennedy (the General Manager and Secretary) they were specially indebted for many reforms and economies, all of which had contributed to the increased earning power of the Company; and he had been well seconded by every one of his subordinates.

The report and balance-sheet were adopted, and a further dividend of 4½ p.ct. (making 8 p.ct. for the year) was declared, leaving a balance of £21,080 to be carried forward.

The Directors of the Oriental Gas Company, Ltd., have resolved to pay, on May 31, an interim dividend at the usual rate of 3½ p.ct., less income-tax, on account of the year ending on June 30 next.

The people of Hatfield (West Riding) have been forced to use oil lamps and candles, owing to the local Gas Company ceasing to supply gas. Serious inconvenience has naturally been occasioned, but steps are being taken to overcome the difficulty.

CURRENT SALES OF GAS PRODUCTS.

The London Market for Tar, Tar Products, and Sulphate of Ammonia.

LONDON, *April* 14.

In the London Market pitch continues in an uninteresting state, and no business is reported. The price is purely nominal. For next season's delivery a certain amount of interest is being taken in the neighbourhood of 70s. per ton f.o.b. makers' works. Creosote is a somewhat quiet market; the price being about 9d. per gallon, net and naked. Solvent naphtha 95/160 is firm at about 1s. 7d. per gallon; pure toluole, about 1s. 10½d. per gallon; and pure benzole, about 1s. 9d. per gallon. Other products are without change.

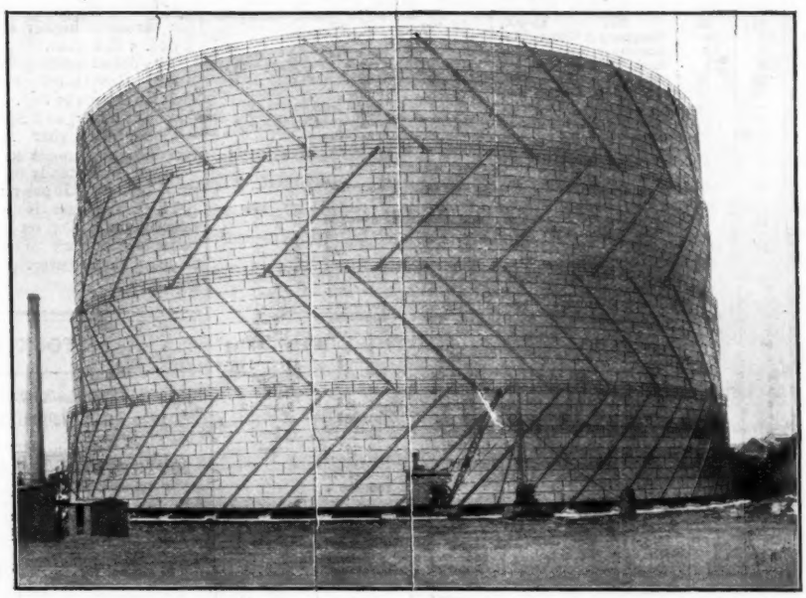
Tar Products in the Provinces.

April 22.

The market for pitch remains quiet, and there is little sign of Continental buyers coming on at present. For this season's delivery business is practically at an end. The only buyers are South Wales, who decline to offer more than the equivalent of 54s. and 55s. f.o.b. As regards September-December, sales have been reported at rather better prices than for prompt delivery; but they do not appear to have been for important quantities, and in the main Continental buyers are holding their hands. Creosote oil is still very quiet; and while there has been some renewal of the demand from America, it is not on the normal scale. Carbolic acid keeps firm; but the price of crude is still in advance of the figure realizable for crystals. Cresylic acid remains quiet, and there is very little demand.

The average values for gas-works products during last week were: Gas-works coal tar, 48s. 6d. to 53s. 6d. Pitch, East Coast, 55s. to 57s. 6d. f.o.b. West Coast—Manchester, 51s. 6d. to 52s. 6d; Liverpool, 52s. 6d. to 53s. 6d.; Clyde, 54s. to 55s. Benzole 90 p.ct., North, 1s. 5d. to 1s. 6d.; crude 65 p.ct. at 120° C., 1s. to 1s. 1d. naked at makers' works; 50-90 p.ct., naked, North, 1s. 8d. to 1s. 10d. Toluole, naked, North, 1s. 5d. to 1s. 6d., nominal. Coal tar crude naphtha in bulk, North, 7½d. to 8d. Solvent naphtha, naked, North, 1s. 4d. to 1s. 5d. Heavy naphtha, North, 1s. 2d. to 1s. 3d. Creosote, in bulk, North, liquid, 7½d. to 7⅝d.; salty, 7½d. to 7⅝d.; Scotland, 7d. to 7½d. Heavy oils, in bulk, North, 9d. to 9½d. Carbolic acid, 60 p.ct., 2s. 1½d. to 2s. 4½d. prompt. Naphthalene, £15 to £16; salts, £6 to £8, bags included. Anthracene, "A" quality, 4d. per minimum 40 p.ct., purely nominal; "B" unsaleable.

Cheaper Gas at Rhyl.—It has been agreed by the Rhyl Urban District Council to maintain the rates at 8s. 10d. in the pound (the same as for the last three years), but to make a reduction of 1s. per 1000 c ft. in the price of gas, bringing the charge down to 4s. A big deficit caused by the coal strike has now been wiped off.



MADE WITH 'BEARSCOT' FITTINGS

ALL STEEL ROLLER CARRIAGES

THE LARGEST SPIRAL GASHOLDER IN THE WORLD
ERECTED AT BELFAST 1923.

R. & J. DEMPSTER, LTD., MANCHESTER.
LONDON OFFICE: 34, VICTORIA STREET, WESTMINSTER, S.W. 1.

STOCK MARKET REPORT.

The acceptance of the Experts' reports by the British, Italian, and Belgian Governments, followed by the notification by Germany that the reports offer a practical basis for the rapid solution of the reparations problem and declaring its willingness to collaborate in the execution of the Experts' plans, had a very salutary effect on European exchanges last week. French francs were higher than they have been since May of last year, and on the strength thereof most of the French securities improved in price, and there was a good demand for Foreign bonds generally.

The proximity of the Easter holidays, however, was very much in evidence during the past week; and although prices were steady, business in other departments was exceedingly small, and some markets might be said not to have opened.

The interest which is now showing itself in the forthcoming Exhibition at Wembley brought about a renewal of the demand for Metropolitan Railway stock.

Oil shares continued in favour. Lobitos, Anglo-Ecuadorian, V.O.C., and Apex (Trinidad) all advanced. There was a little more business in Tea shares, and prices showed improvement. The Industrial and Miscellaneous Markets were irregular, and business generally was on the small side.

The balance-sheet of the Imperial Continental Gas Association is again a strong one. A satisfactory profit and loss account, assisted by a portion of the Association's German claim regarded as revenue, permits of a 10 p.ct. dividend being paid, and an additional 10 p.ct. is being distributed out of the balance of the accretions to capital. The recent rapid rise in the Association's stock would appear therefore to be justified. Gas prices were steady. The only changes in quotations were: Gas Light and Coke ordinary rose ½, to 91-93, and Imperial Continental 2 points, to 147-152.

The following transactions were recorded during the week: On Monday, British 120, 7 p.ct. preference 123¾, Continental Union 28, 28⅛, European 7, Gas Light 91, 91¼, 91½, 91⅝, Imperial Continental 147½, 148, Montevideo 57½, Primitiva (Buenos Ayres) 4 p.ct. debenture 55¾, 56, South Metropolitan 96⅝, 97⅛, 98, South Suburban 98, 98½, 98⅝, Tottenham "B" 99. Supplementary prices, Gas Light 10 p.ct. bonds 193, Oxford 5 p.ct. consolidated 121½, 122, 5 p.ct. preference 88½, 89. On Tuesday, Alliance and Dublin 64½, 64 13/16 *ex* div., Brentford "A" 98½, 99, British 119, Continental Union 28, Gas Light and Coke 91¼, 91⅝, 91⅞, 92, 3 p.ct. debenture 60, Imperial Continental 148½, 149, 150, 151, Maidstone 3 p.ct. debenture 55½, 56½, Primitiva 8s. 3¾d., 5 p.ct. preference 34s., San Paulo 6 p.ct. preference 5⅜, South Metropolitan 98, South Suburban 5 p.ct. 99⅜. Supplementary prices, Southend-on-Sea 5 p.ct. "B" 89½. On Wednesday, Alliance and Dublin 66⅜ *ex* div., Bournemouth "B" 12½, 12⅝, British 119, 120, Commercial 4 p.ct. 91½, Continental Union 28, European 7, Gas Light and Coke 91½, 91⅜, 92, 92⅛, 92¼, 3½ p.ct. maximum 63, 4 p.ct. preference 80, 3 p.ct. debenture 61, Imperial Continental 150, 152, 153, Primitiva 8s., 5 p.ct. preference 33s. 6d., San Paulo 6 p.ct. preference 6, South Metropolitan 97½.

The Money Market prior to the holidays was well supplied with loanable credits. Day-to-day money was obtainable at 2 p.ct., and in many instances 1½ p.ct. was accepted. Discount quotations were usually unaltered. It was anticipated that the Treasury Bills would not favour a higher rate than last week—*i.e.*, £3 0s. 5 84d. p.ct.

The dollar-sterling improved slightly on the week. French francs improved to 69.45, and Belgian francs to 80¼. Italian lire at 97, Swiss francs at 24.67, and Spanish pesetas at 31.82½ were slightly higher. Dutch florins, however, receded on the week to 11.69.

Silver was steady on Indian inquiries; the price being 33½d. per oz. for cash.

The Bank rate is 4 p.ct., to which it was raised from 3 p.ct. on July 5. Bankers' deposit rates are 2 p.ct. The deposit rates of the discount houses are 2 p.ct. at call and 2¼ p.ct. at notice.

ANTE-WAR PRICES AND DIVIDENDS, LATEST DIVIDENDS, AND LAST WEEK'S TRANSACTIONS.

Issue.	Share.	When ex-Dividend.	Ante-War Dividend & Bonus.	Last Divid. at Rate of	NAME.	Closing Prices, July 30, 1914.	Variation. Quotations, April 17.	Variation. Lowest and Highest Prices of Transactions.
£			p.c.	% p.a.				
131,978	Stk.	Feb. 7	—	5	Aldershot 5 p.c. max. C.	..	70—75	...
235,492	,,	,,	4	4	Do. 4 p.c. Pref.	..	68—73	...
1,551,868	,,	Apl. 3	2½	6	Alliance & Dublin Ord.	59—64	64—69*	64½—66½
374,000	,,	Jan. 10	4	4	Do. 4 p.c. Deb.	76—79	90—65	...
280,000	5	Oct. 18	7½	8	Bombay, Ltd.	5¼—6¼	5—5½	...
100,000	10	Mar. 6	—	8½	Bournemouth Gas and Water { 5 p.c. / B 7 p.c. / Pref. 6 p.c. / 4 p.c. Deb.	.. / 15—15½ / 13½—14	12½—13½ / 11½—12½ / 11—12	12½—12⅝
383,110	10	,,	7	7				
115,000	10	,,	6	6				
162,025	—	Dec. 28	—	4		..	75—80	...
992,045	Stk.	Feb. 21	—	6 10/16	Brentford A Consolid.	..	96—101	98½—99
990,500	,,	,,	—	6⅝	Do. B New	..	96—101	...
76,000	,,	,,	5	5	Do. 5 p.c. Pref.	109—111	89—94	...
306,690	,,	Dec. 13	4	4	Do. 4 p.c. Deb.	91—93	76—81	...
214,740	,,	Mar. 6	11	11½	Brighton & Hove Orig.	208—213	170—175	...
244,200	,,	,,	8	8½	Do. A Ord. Stk.	154—159	124—127	...
1,287,500	Stk.	Feb. 21	—	5	Bristol 5 p.c. max.	..	90—91a	...
855,000	,,	Mar. 20	—	7	British Ord.	..	117—122	119—120
100,000	,,	—	—	7	Do. 7 p.c. Pref.	..	120—125	123½
120,000	,,	Dec. 28	4	4	Do. 4 p.c. Deb. Stk	88—90	73—78	...
100,000	10	,,	—	6	Cape Town & Dis., Ltd	1½—2½	6½—7½	...
100,000	10	Oct. 31	—	4½	Do. 4½ p.c. Pref.	4—6	6—7	...
150,000	Stk.	Dec. 28	4½	4½	Do. 4½ p.c. Deb. Stk	70—75	73—78	...
237,860	,,	,,	—	7½	Cardiff 7½ p.c. Deb.	..	105—110	...
157,150	,,	Mar. 6	5	6⅔	Chester 5 p.c. Ord.	108—110	85—90b	...
1,313,280	,,	,,	5/9/4	6	Commercial 4 p.c. Stk.	106—108	90—95	91½
560,000	,,	,,	5½	6	Do. 3½ p.c. do.	103—105	90—95	...
475,000	,,	Dec. 13	5	5	Do. 5 p.c. Deb. Stk.	69½—71½	56—60	...
800,000	,,	14 Jan. 15	4	—	Continental Union, Ltd.	76—79	28—33	28—28⅛
200,000	,,	Dec. 13	7	7	Do. 7 p.c. Pref.	115—118	75—80	...
660,000		Mar. 6	—	6½	Croydon sliding scale.	..	101—104	...
284,975		,,	—	5	Do. max. div.	..	83—86	...
492,270	Stk.	Feb. 21	6	4½	Derby Con. Stk.	123—125	108—110c	...
55,000	,,	Jan. 12	4	4	Do. Deb. Stk.	102—104	74—76c	...
209,000	,,	Apl. 3	—	5	East Hull 5 p.c. max.	..	..	...
1,002,180	10	Jan. 24	10	2	European, Ltd.	17½—18	7—8	7
16,503,045	Stk.	Feb. 7	4/17/4	5½	Gas { 4 p.c. Ord / 3½ p.c. max.	98—102 / 76—79	91—93 / 60—63	91—92½ / 63
2,600,000	,,	,,	3½	3½	Light { 4 p.c. Con. Pref. / 3 p.c. Con. Deb.	96—99 / 72½—74½	77—80 / 58—61	80 / 60—61
4,062,235	,,	,,	4	4	Coke { 10 p.c. Bonds / 7½ p.c. Ilford Deb	— / ..	.. / ..	193 / ...
4,761,930	,,	Dec. 13	3	3				
130,000	,,	Dec. 11	10	10				
42,000	—	—	—	7½	Hastings & St. L. 5 p.c.	..	91—96	...
82,500	,,	Mar. 20	5	6⅔	Do. 3½ p.c.	87—89	76—81	...
258,740	,,	,,	3½	5⅛	Hongkong & China, Ltd.	16½—16¾	16—17	...
70,000	10	Oct. 18	11	10	Hornsey 7 p.c.	..	143—148	...
86,600	Stk.	Mar. 6	9	10	Imperial Continental	150—160	147—152	147½—153
1,976,000	,,	Nov. 15	9	5	Do. 3½ p.c. Deb. Red.	84—86	69—72	...
401,400	,,	Feb. 7	3½	3½	Lea Bridge Ord. 5 p.c.	119—121	92—97	...
235,242	,,	Mar. 6	6½	6½	Liverpool 5 p.c. Ord.	—	89½—90½b	...
2,127,340	,,	Feb. 21	—	5⅛	,, 7 p.c. Pref.	..	103—106b	...
600,000	,,	Mar. 20	—	7	Maidstone 5 p.c.	—	124—129	...
165,736	,,	Feb. 21	7/5/6	8	Do. 3 p.c. Deb.	—	54—59	55½—56½
63,480	,,	Dec. 28	—	3	Malta & Mediterranean Met. of Melbourne } 4½ p.c. Deb.	4½—4¾	3½—3¾	...
75,000	5	Dec. 13	6	5		99—101	93—96*	...
50,000	100	Apl. 1	4½	4½				
541,920	Stk.	Nov. 29	4	4	Montevideo, Ltd.	..	54—59	57½
1,875,892	,,	Mar. 6	4½	5⅛	Newcastle & Gatsh'dCon.	98½—99½	85—86d	...
250,166	,,	,,	—	4	Do. 4 p.c. Pref. Stk.	..	73—75d	...
329,705	,,	Dec. 28	3½	3½	Do. 3½ p.c. Deb.	82—83	71—73d	...
15,000	10	Mar. 6	—	11	North Middlesex 10 p.c.	—	16—17	...
75,940	10	,,	7/14/0	7 1/20	,, ,, 7 p.c.	14—15	11½—11¾	...
300,000	Stk.	Nov. 29	8	9	Oriental, Ltd.	117—122	98—103	...
138,120	Stk.	Dec. 28	—	7½	Plym'th & Stonh'se 5 p.c.	—	107—112	...
60,000	50	Mar. 6	13	13	Portsea Island, B	128—131	102—105	...
100,000	50	,,	12	12	Do. C	118—121	98—103	...
1,450,345	5	29 Oct. 14	8	—	Primitiva Ord.	5½—6	⅞—1	8/—8/3½
2,499,800	5	30 Dec. 15	5	—	Do. 5 p.c. Pref.	4¾—5	1⅛—1¼	33/6—31/-
341,400	100	Dec. 3	4	4	Do. 4 p.c. Deb.	91—93	70—75	...
600,000	Stk.	Jan. 24	4	4	Do. ,, ,, 1911	—	54—57	...
220,335	,,	Dec. 28	4	4	Do. B. Aires 4 p.c. Deb.	85—87	55—58	55½—56
321,670	,,	,,	4	4	Do. Riv. Pl. 4 p.c. Deb.	85—87	55—58	...
150,000	10	Oct. 4	6	6	San Paulo { 6 p.c. Pref. / 5 p.c. Deb.	10¾—11 / 47—49	5¾—6 / 39—41	5¾—6 / ...
125,000	50	Jan. 2	5	5				
270,000	Stk.	Mar. 20	—	5/8/4	Sheffield A	..	100—102a	...
419,968	,,	,,	—	5/8/4	Do. B	..	103—102a	...
1,047,000	,,	,,	—	5/8/4	D2½ C	..	100—101c	...
133,201	Stk.	—	4	6	Shrewsbury 5 p.c.	—	..	...
90,000	10	Oct. 18	9	6	South African	10¾—11¼	7—9	...
6,609,895	Stk.	Feb. 21	5/9/4	6½	South Met. Ord.	111—113	96—98	96½—98
102,580	,,	Jan. 10	—	5	Do. Red. Pref.	—	98—100	...
1,895,445	,,	,,	3	3	Do. 3 p.c. Deb.	72¾—74¼	57—60	...
734,000	,,	Mar. 6	—	6½	Do. 6½ p.c. Deb.	..	103—105	...
91,500	,,	Aug. 23	8½	8½	South Shields Con. Stk.	157—159	136—138d	...
1,087,795	,,	Feb. 21	6	6⅓	S'th Suburb'n Ord. 5 p.c.	114—116	97—100	98—99½
368,837	,,	Dec. 28	5	5	Do. 5 p.c. Deb. Stk.	116—118	93—100	...
647,740	,,	Nov. 15	5	6	S'th'mpt'n Ord. 5p.c. max	99—102	86—89	...
121,275	,,	Dec. 28	4	4	Do. 4 p.c. Deb. Stk.	..	74—79	...
250,000	,,	Mar. 6	—	7	Swansea 7 p.c. Pref. Stk.	..	100—102	...
200,000	,,	Dec. 28	—	6½	Do. 6½ p.c. Deb. Stk.	..	102—104	...
120,000	,,	Feb. 21	—	8	Tottenham { A 5 p.c. / B 3½ p.c.	135—138 / 115—117	119—124 / 98—103	... / 99
882,275	,,	,,	6	6⅛	District { 4 p.c. Deb.	87—89	77—81	...
281,255	,,	Dec. 13	4	4	Tynemouth Con. & New	108¾—109	86—88d*	...
258,251	Stk.	Mar. 20	5	7/14/4	Wandsworth, Wimbledon, and Epsom—			
90,000	,,	Mar. 6	8½	9⅓	Wandsworth A 5 p.c.	151—156	132—137	...
355,636	,,	,,	6½	7½	Do. B 3½ p.c.	129—134	110—115	...
108,075	,,	,,	5/17/3	6/7/9	Do. C	110—115	96—101	...
240,865	,,	,,	—	6/7/9	New Ordinary	..	..	...
352,000	,,	,,	6½	7½	Wimbledon 5 p.c.	117—122	108—113	...
98,000	,,	,,	6½	7½	Epsom 5 p.c.	121—126	112—117	...
88,416	,,	Dec. 28	3	3	3 p.c Deb. Stk.	66—69	56—61	...

Quotations at:—*a.*—Bristol. *b.*—Liverpool. *c.*—Nottingham. *d.*—Newcastle. *e.*—Sheffield. * Ex div.

STOCK ISSUE.

By Order of the Directors.

NEW ISSUE OF CAPITAL.

SOUTHEND-ON-SEA AND DISTRICT GAS COMPANY.

(Incorporated 1877.)

MESSRS. A. & W. RICHARDS

Are instructed to offer for SALE, by TENDER,

£45,000

FIVE PER CENT. PERPETUAL DEBENTURE STOCK.

Minimum Price, £96 10s. per £100.

Yielding £5 3s. 8d. per cent.

The Net Revenue of the Company last year was £81,518, and as the Interest on the Loan Capital, including the present issue, only requires £7671, it is more than four times covered.

Prospectus and Form of Tender (which latter must be sent in by 11 o'clock on Tuesday, April 29) may be obtained of Messrs. A. & W. Richards, 87, Wallbrook, E.C. 4.

Objecting to a Gasholder.

An interesting legal fight has taken place in connection with the desire of the City of Albany (N.Y.) Gas Company to erect a 3 million c.ft. gasholder on their property in the city. Upon application, they were refused a permit to do this, because of an ordinance passed last year providing that no gas tank, holder, or container should be erected within the corporate limits. Thereupon the Company sought from the Law Courts a peremptory mandamus and a temporary injunction to restrain the enforcement of the ordinance. The Company's view was that the ordinance was apparently passed to prevent the erection of the proposed holder. The New York Supreme Court held that the ordinance was unreasonable and arbitrary, and granted the application for a mandamus order directing the issue of a permit. While "not unmindful of the fact that a gas plant is at times obnoxious and somewhat offensive," the Court also remembered "the fact that it is a necessity." The business pursued by the Company was a legitimate one, and without sufficient storage capacity they could not carry out their purposes.

A Gas Tragedy at Sheffield.—At an inquest on Joseph Bills, held at Sheffield last week, the father of the dead man said that death had been caused by a faulty gas-meter. He stated that the meter had been wrong for three years, and during the past 2½ years had been repaired four times. The Coroner said that, in view of this suggestion, the inquest could not be concluded. The jury agreed to adjourn the inquiry until to-day.

Gas Cooking in Singapore.—It is stated by the "Ironmonger" that the Municipal Council of Singapore are trying to stimulate the use of gas for cooking, and an increased demand for gas cooking appliances may follow. At present, the cooking facilities in most houses in Singapore, even the best European residences, are very primitive. It has been difficult to awaken the interest of Europeans in modern kitchen installations.

Suggested Extension Scheme for Forfar.—Having been called in to report upon the gas-works, Mr. S. Milne, of Aberdeen, has advised the Forfar Town Council to undertake alterations and extensions estimated to cost practically £20,000. He points out that mains are too small for the work they are called upon to do, and his other suggestions include a further gasholder, an extension of the purifying plant, a duplicate rotary washer-scrubber, an additional station meter, and a Lancashire steam boiler. Councillor Jamieson (the Convener of the Gas Committee) proposed that a special meeting should be held to consider the matter, and this was agreed to, as being the best course to adopt.

Consolidated Gas Company of New York.

The net income for 1923 of the Consolidated Gas Company of New York and affiliated gas and electricity undertakings amounted to $28,253,250, as compared with $21,872,798 in the previous year. At Dec. 31 last the undertakings had in service 1,042,024 gas-meters and 735,190 electric meters. The gas sales of the Consolidated Company itself during 1923 increased 2,094,133,400 c.ft., or 9·53 p.ct. over the preceding year; while in 1922 the sales were 2·67 p.ct. more than in 1921. In the Borough of Manhattan gas sales in 1923 increased 2,520,633,600 c.ft. (9·12 p.ct.) over 1922, which year, in its turn, showed an increase of 2·44 p.ct. over 1921. In the Borough of the Bronx gas sales in 1923 gained 863,721,500 c.ft. (15·72 p.ct.) over 1922, while the sales in 1922 were 2·95 p.ct. above 1921. On Dec. 31, the average investment per dollar of gross earnings for the year 1923 amounted to $4.47. About 29 cents is therefore required out of every dollar collected for even so low a return as 6·47 p.ct. on the investment employed in producing this dollar. Such a rate of return is less than the current cost of money required by public utilities for capital purposes. It was found to be impracticable to add further to the capacity of the Astoria plant, and 230 acres of land have been purchased at Hunt's Point, in the Borough of the Bronx. It is proposed to proceed with the erection upon this site of coal-gas and water-gas plant in suitable units, so that at the expiration of ten years the Company may have constructed and in operation coal-gas and water-gas apparatus of a combined daily capacity of approximately 100 million c.ft. Thereafter extensions will be made to existing plants, with the object always in view of maintaining, as closely as possible, the relationship of 75 p.ct. of water-gas plant and 25 p.ct. of coal-gas apparatus. This extension, it is calculated, should carry the Company on until about 1940, when additional land will again have to be provided for further plant.

The Evelyn Manufacturing Company has been registered, with a capital of £1000, to carry on a gas-mantle and gas and electrical fitting manufacturing business. The address is No. 2, Evelyn Street, Deptford, S.E.

Southend Gas Debenture Issue.—Instructions from the Directors have been received by Messrs. A. & W. Richards, of No. 37, Walbrook, E.C., to offer for sale by tender £45,000 of 5 p.ct. perpetual debenture stock of the Southend-on-Sea and District Gas Company, at the minimum price of £96 10s. per £100. The yield at this figure is £5 3s. 8d. p.ct. The output of gas is growing very rapidly, and the new capital is being raised for extension of the works, mains, &c. Tenders must be sent in to the firm not later than 11 o'clock on Tuesday, April 29.

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Tender in sealed envelope, endorsed, to be delivered by May 1.
The Directors do not bind themselves to accept the lowest or any Tender.
J. E. LISTER COOPER,
Manager and Secretary.
Gas-Works,
Yeadon,
April 17, 1924.

RHONDDA URBAN DISTRICT COUNCIL.
(GAS AND WATER DEPARTMENT.)

THIS Council are prepared to receive TENDERS for the following:
CONTRACT No. 65.—The supply of 4100 yards of 15-inch, 300 yards 4-inch, and 600 yards 3-inch CAST IRON PIPES, Class D.
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Specification and Form of Tender for Contract No. 65 can be obtained, while the Plans and Specifications for Contracts Nos. 66 and 67 MUST BE INSPECTED, at my office.
The Contractor will be required to pay the Standard Rates of Wages recognized in the District.
Tenders to be addressed to the Chairman of the Gas and Water Committee, endorsed "Contract No. 65, 66, or 67" (as the case may be) and Delivered to the undersigned not later than 10 a.m., Tuesday, the 6th day of May prox.
The Council do not bind themselves to accept the lowest or any Tender.
OCTAVIUS THOMAS,
Engineer and Manager.
Gas and Water Offices,
Pentre, Rhondda,
April 15, 1924.